GAS

APRIL 1960

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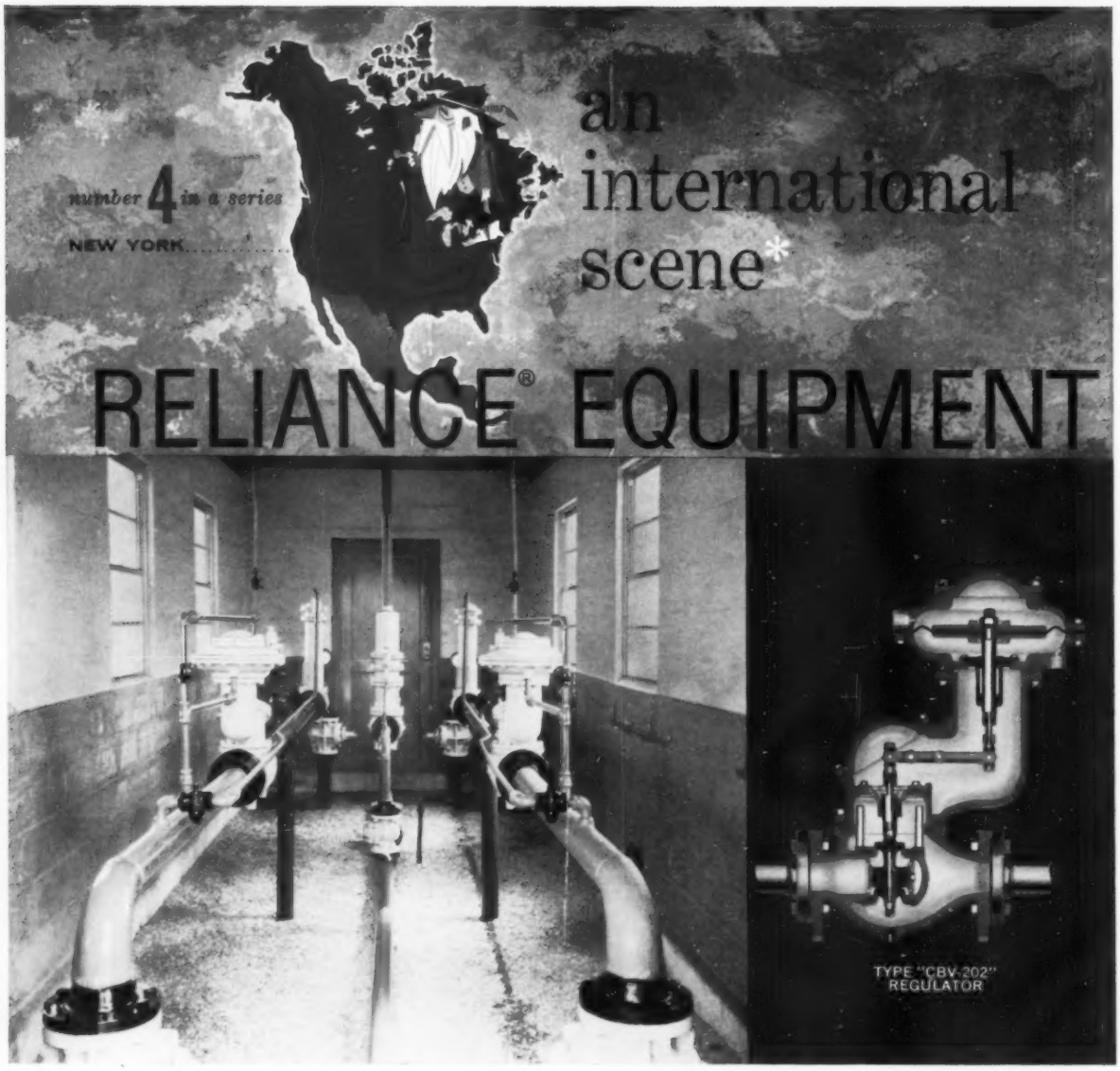

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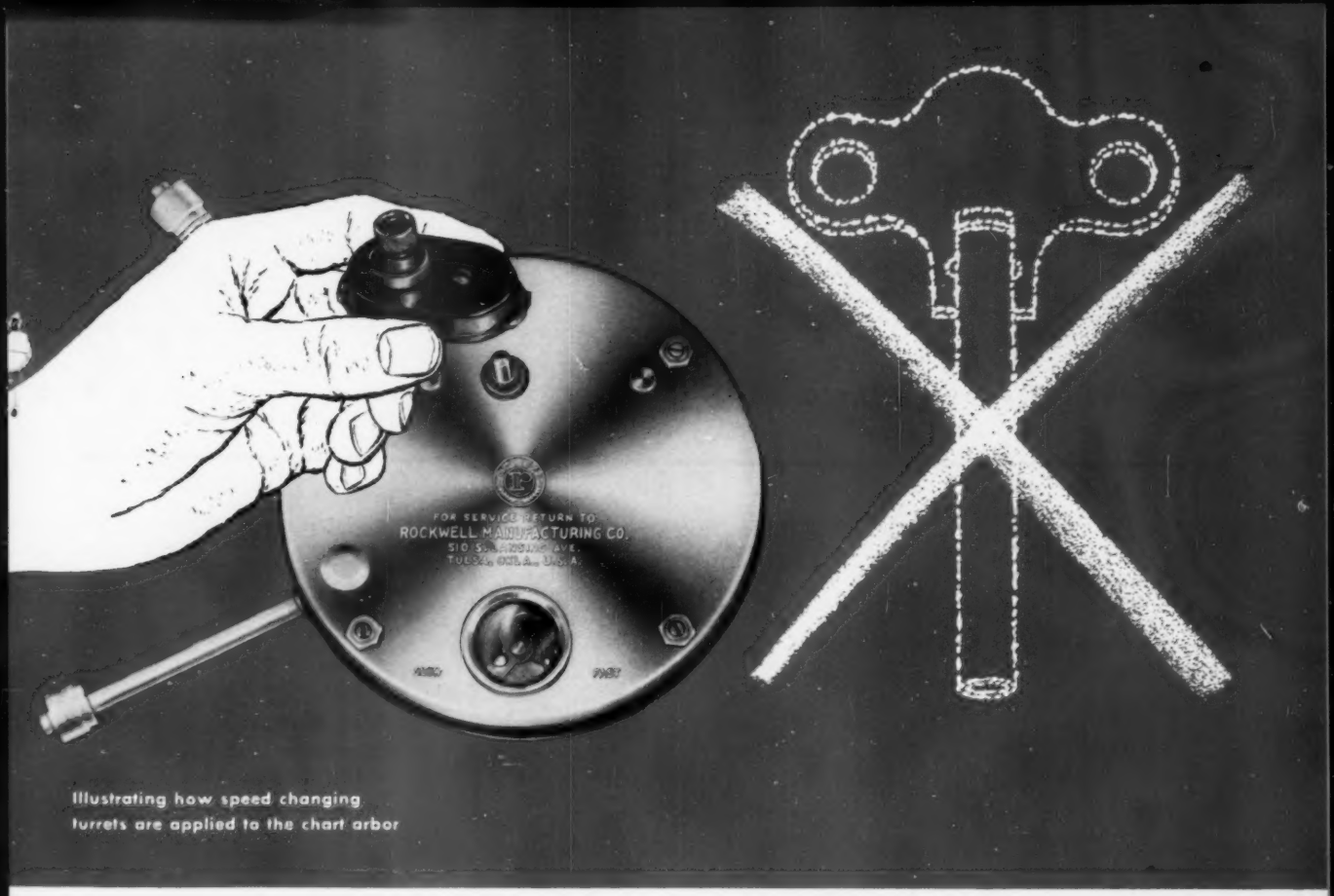

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GAS

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36TH YEAR OF PUBLICATION

VOLUME THIRTY-SIX • NUMBER 4

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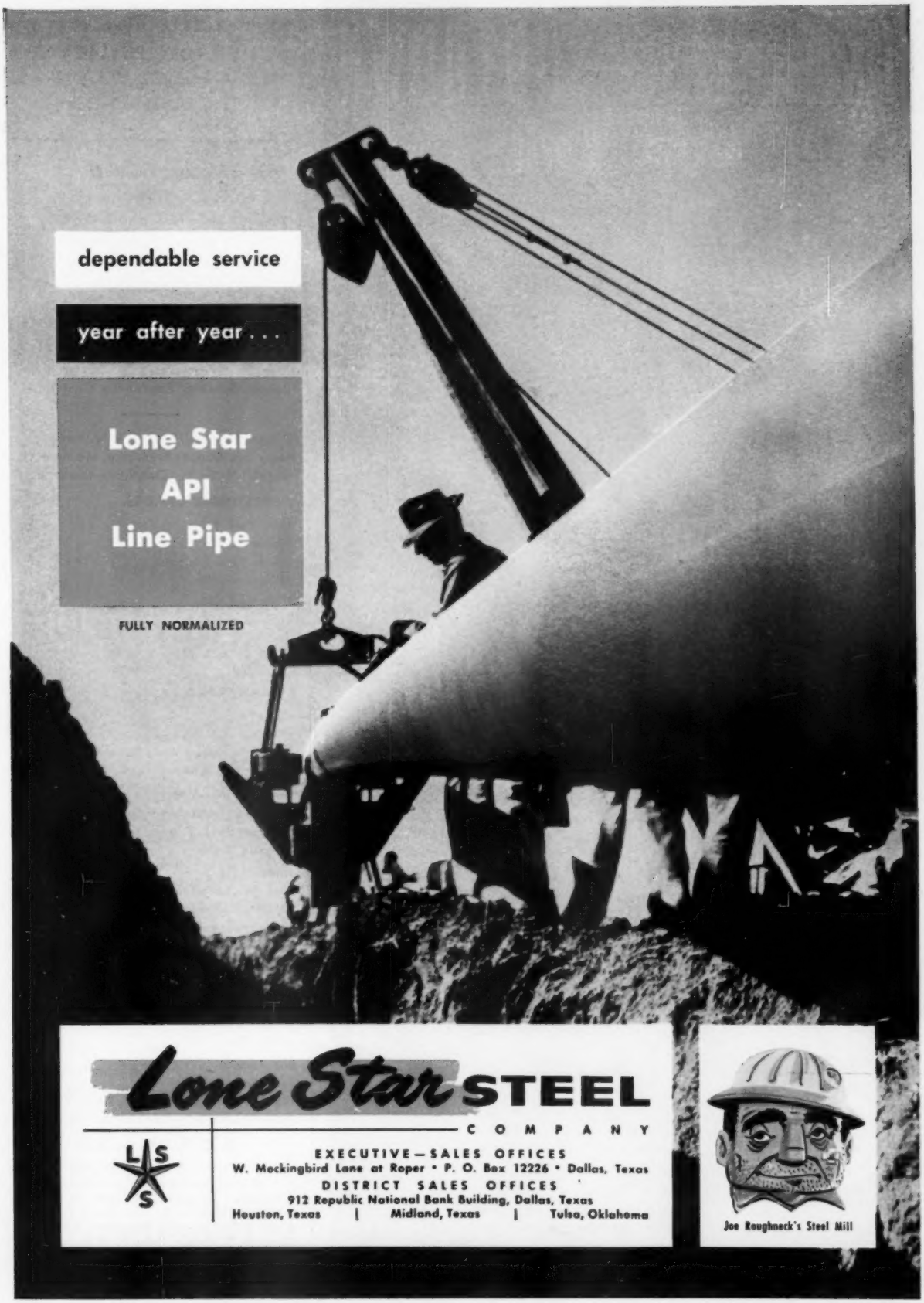
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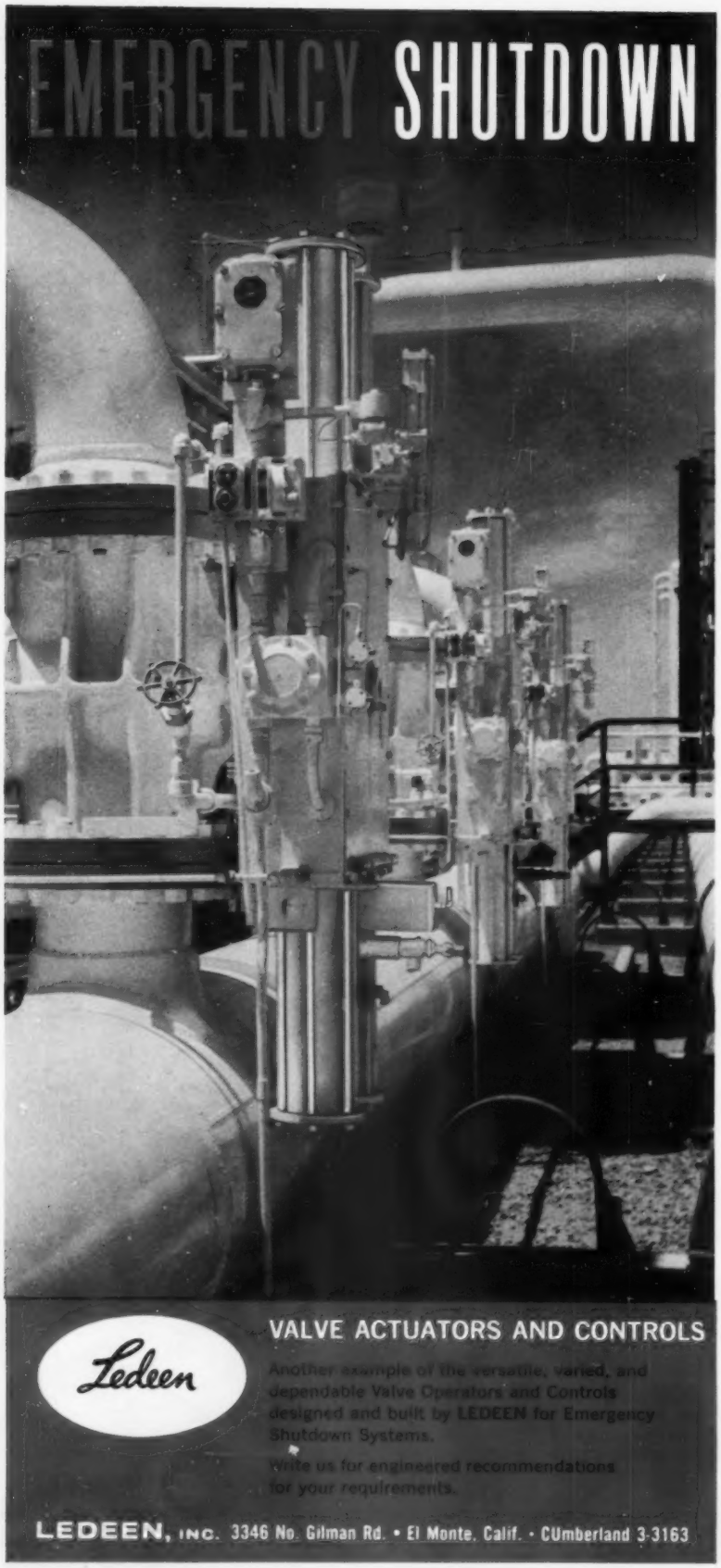
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MR. CONTROLS

GAS

APRIL, 1960

Thermally Thinking

THE pyramids of Egypt are a long way from La Canada, Calif. Frankly, I have never seen the things, and it is a good bet that I never will. However, I do have some non-original feelings about these fantastic stone constructions monumentalizing big wheels of old.

Somewhere in some random reading, these words climaxed an otherwise unprofitable afternoon. They were spoken by the late American, John Foster Dulles. He said: "When I travel in various parts of the world, I seem to see different things than many other persons. For example, many persons who visit Egypt marvel at the pyramids as great monuments of earlier civilizations. But the pyramids do not appeal to me primarily as great monuments of earlier civilizations. When I see the pyramids, I see tens of thousands of poor, under-nourished Egyptians carrying heavy physical burdens as they painfully struggle to build the pyramids. I see these poverty-stricken people carrying for years the oppressive burden of the great costs of the pyramids. Thousands toiled, suffered, and died to build them. This is what I see when I look at the pyramids."

As one travels across this great country, sees its vast edifices dedicated to government-owned business, and contacts the huge pyramid of this enormous government which reaches into most phases of domestic and business life, one can be jolted.

Now, after reading Dulles' profundity, I see millions of men and women in these United States toiling away carrying an almost too-heavy burden of taxation. I see these people carrying this heavy load as they painfully struggle year after year to pay for building a still larger pyramid of government, building federal aid, building unimaginable stockpiles of products, building price supports, building bonuses and subsidies, building colossal malignancies under the name of public power projects, and building a federal budget and fiscal policy that may put us in a deeper grave than even the Soviets want to dig for us.

I see the oppressive burden of the great costs of the "U. S. pyramids" being transferred to the backs of your children and my son. The federal debt stood at $291 billion the last time I had guts enough to look. It will go higher as the American people demand more services, subsidies, public power, and benefits from the government for which they are not willing to pay.

For, you see, unlike the Egyptians who were oppressed by dictatorial individuals who wanted pyramids built, we oppress ourselves as we toil and suffer from taxation. As one of Bob Adams' Navajoes might say—we even speak with forked tongues.

Millions of Americans condemn increased government expenditures, our unbalanced budget (and it will wind up unbalanced again this year in spite of what Ike says), and high taxes. Yet, out of the other side of their mouths they cry, through their representatives in Congress, for more government and all the things it can "give." They persist in indulging in the pleasant illusion that federal expenditures do not come from local taxpayers.

The gas industry should be an awfully valid wellspring for some political leadership and sound public policy idea generation.

Gas companies would do well to activate a nonpartisan political program within themselves. Gulf Oil Corp. has one that many people feel is excellent. Art Lorton with Gulf down there in Houston would, I suppose, fill you in on it or you could get in touch with their P/R fellows at P. O. Box 1166, Pittsburgh 30. The least any gas company can do is try.

A good example of what can be done turned up recently when John F. Merriam, president of Northern Natural Gas Co. (Omaha), sent distribution companies, Congressmen, and other government leaders in Northern's area a proposed plan of federal income tax relief for companies whose rates are regulated by government commissions. His plan makes sense because it brings relief to consumers who have enough taxes of their own to pay without taking on taxes of regulated businesses that are passed on to them through the regulatory process.

I am sure that John Merriam is a mighty smart man, but he has no monopoly on idea creativity in the gas industry. Gas industry executives and any other employee can produce thinking and political intelligence that will nurture this country. It is certainly time to do so.

J. Fred Ebsen
EDITOR

THE *NEW* ROOTS 3000 cfh GAS METER IS "JUST A BULGE IN THE LINE!"

*Size 3M125 ½ actual size

Gas men who've previewed it are mighty excited about the cost saving features of the new Roots-Connersville 3000 cfh rotary gas meter. Only 14" long, a workman can pick it up with one hand and carry it under his arm.

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GAS HIGHLIGHTS

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Canadian NG growth

Natural gas lines of all types—gathering, transmission, and distribution—in Canada totaled 6000 miles in 1950. The 1959 figure shows 28,000 miles and it's still growing. Natural gas now accounts for under 10 per cent of Canada's domestic energy requirements. But a conservative study—part of the Harvard Economic Studies—predicts this fuel will supply 700 trillion Btu or 12.2 per cent of Canada's domestic energy in 1970. For accomplishment, gas production must grow. Canadians are exploring and drilling in northern parts of the western provinces and in the territories. Petroleum strike has been made within 200 miles of the Yukon-Arctic coast. Gas and oil possibilities look good farther north, even on the Arctic islands.

Congressman aims bills at FPC

In early March, Rep. Ken Hechler (D.-W. Va.) called for a "sweeping" Congressional investigation of the FPC for its "failure to protect the public interest in the face of rising natural gas rates." He proposed to introduce a bill authorizing the investigation. He also introduced a bill—very similar to the one introduced by Rep. Lawrence Brock (D.-Neb.)—which limits the practice of granting temporary interim rate increases while "FPC ponderously and timidly mulls for uncounted weeks over the petitions for such increases."

Income tax relief suggested

A plan for relief from Federal income taxes for companies whose rates are regulated by government commissions has been proposed by Northern Natural Gas' John Merriam. He recommends special reductions—with eventual elimination—for gas utilities, pipelines, etc., because rates of such privately owned businesses are regulated; hence, any income tax reduction could and should be passed on to consumers through the regulatory process. Thus, income tax reductions on earnings of regulated utility companies would automatically result in savings to the customer. In addition to the rate shaving aspects and the public's interest, the plan would eliminate existing discrimination against investor-owned companies in favor of non-tax paying publicly owned or government-owned utilities. Timing of the announcement was planned so that Congress can study the Merriam proposal during its present session.

PLGS will back Transwestern's field gas prices

Pacific Lighting Gas Supply Co. (Los Angeles), prime customer of Transwestern Pipeline Co. (Houston), was expected to support Transwestern's producer price level during FPC hearings which started March 21. FPC had previously found prices Transwestern agreed to pay gas producers "reasonable" after reducing initial prices to 14 independent producers from 1 to 6 cents per Mcf. The conditioned producers accepted the topping off provided they could later ask for prices higher than those set by FPC in the Aug. 11 decision, but agreed that new prices would not be higher than those contained by the original contracts.

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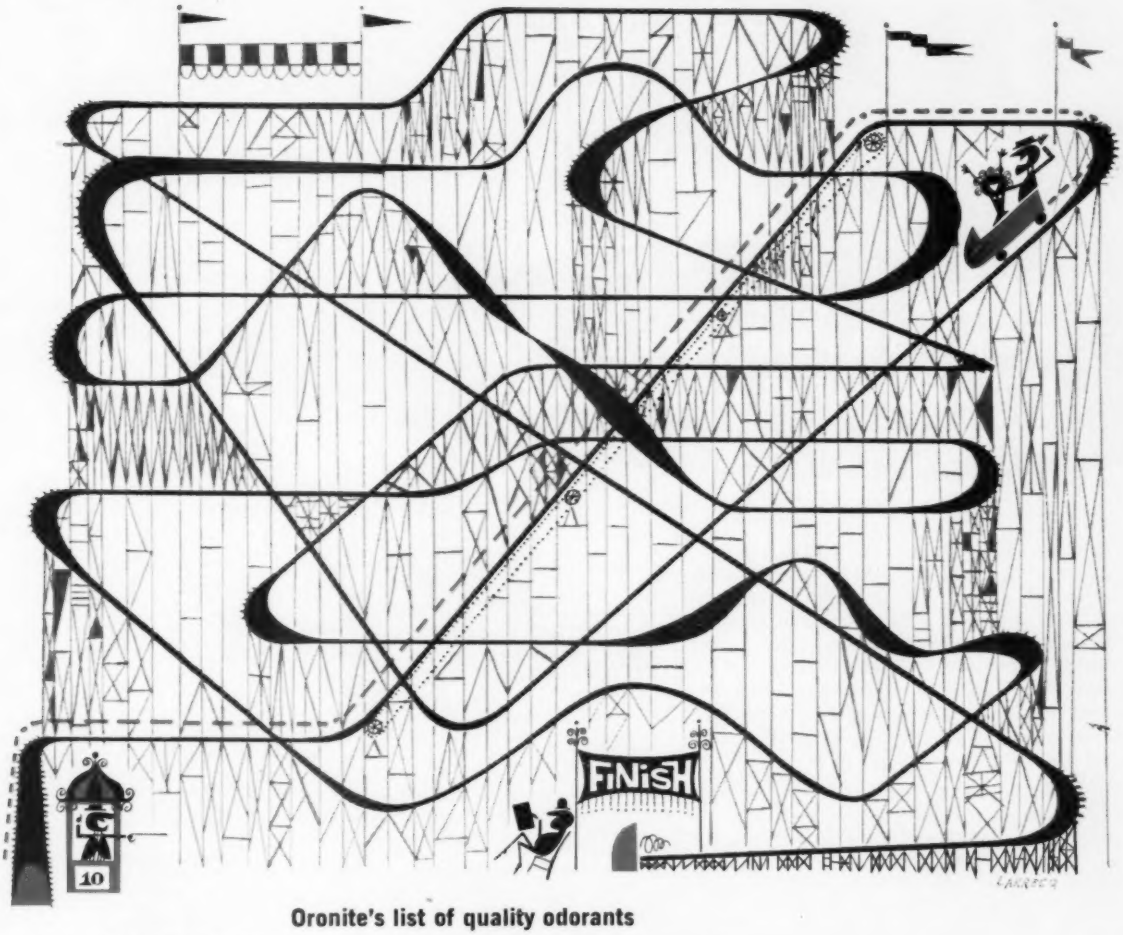

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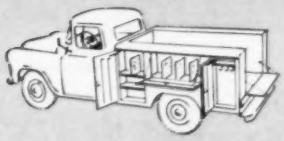
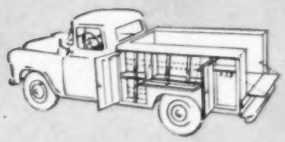
FOR GAS WORK





Series 22-G. Two variations of this model are available for carrying either cast or tin meters. Rubber-padded compartments insure the safe storage of fragile parts and instruments.

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Imperfections of the Natural Gas Act

YEARS of experience in the administration of the Natural Gas Act have revealed its imperfections. Considering the multiple proposals to amend the Natural Gas Act, a resume of the agitation by industry and the Federal Power Commission should be helpful to management in planning ahead.

The bills proposing to modify or limit the commission's jurisdiction over independent producers or gatherers of natural gas were engendered by the *Phillips* case in 1954. H.R. 366 (Harris) is similar to H.R. 8525 in the 85th Congress. In addition, H.R. 366 sets out a standard to govern the rates of off-peak gas and defines "off-peak sales," "demand rate," and "commodity rate."

H.R. 366 seeks to exempt producers of natural gas from regulation under the Natural Gas Act as public utilities. It would, instead, regulate the price at which gas is sold under "producer contracts" on the basis of a "reasonable market price" standard under which natural gas, when sold by the producer, would be treated as a commodity. The commission reported in favor of the basic features of this bill and recommended the enactment of similar legislation.

In providing for this method of regulating sales by producers, H.R. 366 would add numerous safeguards to the Natural Gas Act for the purpose of protecting the interests of consumers, pipeline companies, and investors in adequate long-term supplies of natural gas at prices which would be fair to all concerned.

H.R. 976 (Williams) and identical bill H.R. 5531 (Alger) provide that the Natural Gas Act shall not apply to sales incident to the production or gathering of natural gas by an independent producer if he is not engaged in the transportation of such gas in interstate commerce or in the distribution of such gas to ultimate consumers. H.R. 2176 (Ikard) removes the jurisdiction of the commission over any sale of natural gas before or at the point of its delivery into the interstate transmission facilities of a natural gas company transporting the gas beyond the producing field, and further allows the "fair commodity value" with respect to gas produced or controlled by a pipeline.

Sen. Magnuson introduced 13 bills (S. 2248 through S. 2260) proposing amendments to the Natural Gas Act recommended by FPC in its 38th Annual Report.

S. 452 (Smathers), by amending the Natural Gas Act and several other particular statutes, would separate the transportation industry into several components, i.e., air, water, rail, motor vehicle, and pipeline (oil and gas). It would prohibit the issuance of a certificate of convenience and necessity authorizing a person to engage in one type of transportation if he has a direct or indirect interest in another type of transportation. The bill would also prohibit strikes by employees in one segment of the transportation industry in support of the activities or objectives of the employees in another segment. In respect to the provisions of the bill relating to matters within its jurisdiction, FPC found the bill contrary to the public interest and recommended that all provisions of the bill pertaining to natural gas companies as defined by the Natural Gas Act be deleted.

H.R. 1071 (Vanik) would amend section 4(c) of the Act to prohibit filing with the commission a proposed schedule increasing rates or charges under a previously entered into contract, unless the purchaser under the contract has agreed to the actual amount of increase. The commission has not yet reported on this bill, but has recommended the enactment of two bills to the opposite effect.

H.R. 3265 (Bennett of Michigan) would amend section 7(a) of the Act to give the commission additional authority, upon application of any state, municipality, state commission, or gas distributing company to require a natural gas company to extend its transportation facilities into any area not already being served by it, if the commission determines the company can supply the gas and that an economically feasible market for the gas exists in the area. The commission's report on this bill expressed the belief that the proposed amendment is not necessary for effective regulation in the public interest under the present certificate provisions of the Natural Gas Act, and that such an amendment would raise serious legal and constitutional problems.

R.R. 3286 (Daddario) proposes to amend the Natural Gas Act to add section 7(i) so as to authorize the commission to prescribe safety regulations with respect to the construction and operation of natural gas pipelines.

H.R. 3925 (Saylor) proposes to amend section 3 of the Act (15 U.S.C. 717b), which prohibits the exportation or importation of natural gas without FPC approval by adding the following sentence to the section: "It shall not be deemed to be consistent with the public interest to authorize the exportation or importation of natural gas in any case where the commission finds that such exportation or importation will result in economic

dislocation, unemployment, or injury to competing fuel industries of the United States."

The commission reported unfavorably upon this bill, stating that the term "public interest," as now contained in section 3 of the Act, contemplates that the commission should weigh all the facts and that a legislative order that the existence of any of the specific factors enumerated in this bill is sufficient to classify a proposed importation or exportation as inconsistent with the public interest would be a drastic policy determination by Congress, making almost nugatory the authorizations now provided for in section 3. The commission further indicated that the introduction of a competing fuel into an area served by another fuel almost inevitably produces injury to the first fuel in the market.

No congressional action was taken in the 1st session of the 86th Congress with respect to any of these bills to amend the Natural Gas Act.

FPC has recommended to the committees of Congress and the Bureau of the Budget that the Natural Gas Act be amended.

These recommendations are those on which a majority or more of the commission are in agreement.

Regulation of independent producers.—That the pertinent sections of the Natural Gas Act be amended to provide for (1) elimination of any requirement for certificates of public convenience and necessity for producers of natural gas; (2) a standard for pricing or evaluating natural gas as a commodity which would not require use of a rate base or traditional utility ratemaking principles, but which would enable the commission to weigh the interests of the consumer in low prices with the necessity of providing assurance of future gas supplies; (3) elimination of any mandatory requirement for determining and considering costs of or revenues from other products sometimes obtained in conjunction with the production of natural gas, including oil and liquid hydrocarbons, and spelling out with greater particularity the present authority of the commission to fix producer rates on an area basis; (4) the same treatment of independent producers and pipeline producers with respect to pricing or evaluating natural gas ; (5) elimination of clauses in independent producers' contracts of sale to interstate gas transmission companies which contain provisions for a change of price to the purchaser by reason of (a) changes in the price received by the purchaser on resale, or (b) the payment or offer of payment of different prices by the purchaser or other purchasers to the seller or to other sellers.

Rate changes under Natural Gas Act.—That the rate-changing procedure of section 4 of the Natural Gas Act be made available to companies seeking to change any filed rate where the purchaser has not agreed to the change.

Sales for resale for industrial use only.—That section 4(e) of the Natural Gas Act be amended so that the commission will have full authority to suspend rate schedules covering sales by interstate pipeline companies of natural gas for resale for industrial use only.

Amendments to rate section 5(a).—That section 5(a) of the Natural Gas Act be amended to provide express authorization for the commission (1) to increase interstate pipeline rates where necessary to correct undue discrimination; and (2) to allocate gas among customers of an interstate natural gas pipeline company in periods of shortage.

Amendments to certificate section 7(c).—That section 7(c) of the Natural Gas Act be amended (1) to eliminate the mandatory hearing requirement, substituting instead a requirement for due notice and opportunity for hearing; (2) to provide specifically for control by the commission of the allocation of natural gas when required for national defense or to safeguard the available supply in emergency situations; (3) to require by express language a certificate for the construction of facilities to be used for transportation of gas in interstate commerce, when the person merely constructing the facilities will not operate the facilities but will sell or lease the facilities to an interstate operator; and (4) to enlarge the commission's authority to grant temporary certificates of public convenience and necessity in any emergency situation where no objection to issuance has been filed after due notice has been given.

Abandonment of service.—That section 7(b) of the Natural Gas Act be amended (1) to eliminate the mandatory requirements for hearing, substituting instead a requirement for due notice and opportunity for hearing; and (2) to make it clear that the section applies to service as well as to facilities and to curtailment as well as abandonment of service.

Amendments to section 7(f).—That section 7(f) of the Natural Gas Act be amended (1) to eliminate the service-area provision; and (2) to provide for the enlargement of the existing facilities of an interstate pipeline company to serve present customers under such rules and conditions as the commission may prescribe.

Safety regulations.—That section 7 of the Natural Gas Act be amended so as to authorize the commission to prescribe safety regulations with respect to the construction and operation of interstate natural gas pipelines.

Interventions.—That the commission be authorized to refuse to admit as a party to a proceeding any person who represents an interest which is adequately represented by another party.

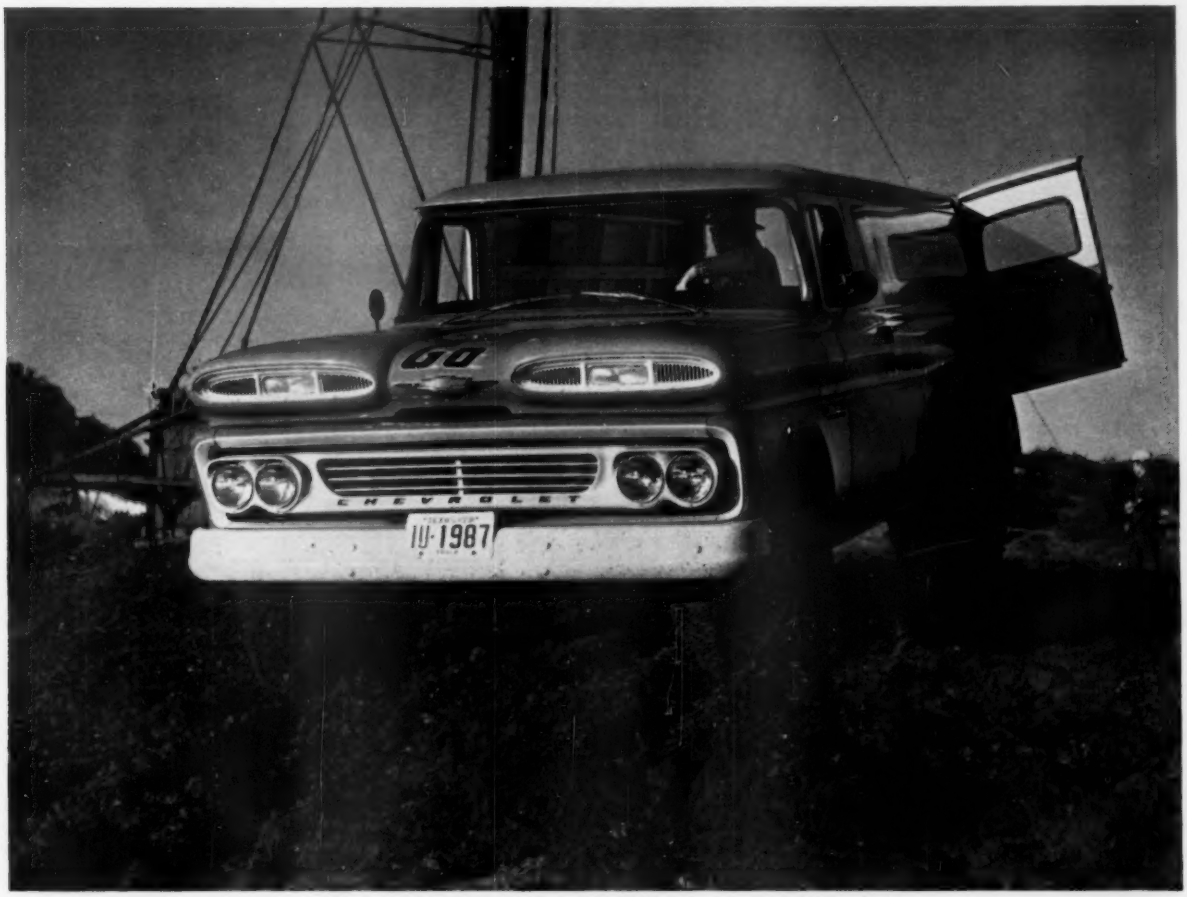
Commissioners' tenure of office.—That section 1 of the Federal Power Act with respect to terms of office of members of the commission be amended in order to enable the incumbent to hold over after the expiration of his term to prevent a vacancy occurring in the office.

Amended as to security issue regulation.—That section 12 of the Natural Gas Act be amended so as to give the commission jurisdiction with respect to the approval of security issues of interstate natural gas pipeline companies.

Emergency interconnections.—That a new subsection be added to section 7 of the Natural Gas Act giving the commission authority in emergencies to require inter-

Continued on page 94

OWNERS AGREE: A '60 CHEVY IS WORTH MORE BECAUSE IT WORKS MORE!



CHARLIE OWEN STAKES HIS WHOLE OPERATION ON CHEVY'S STAMINA AND TORSION-SPRING RIDE

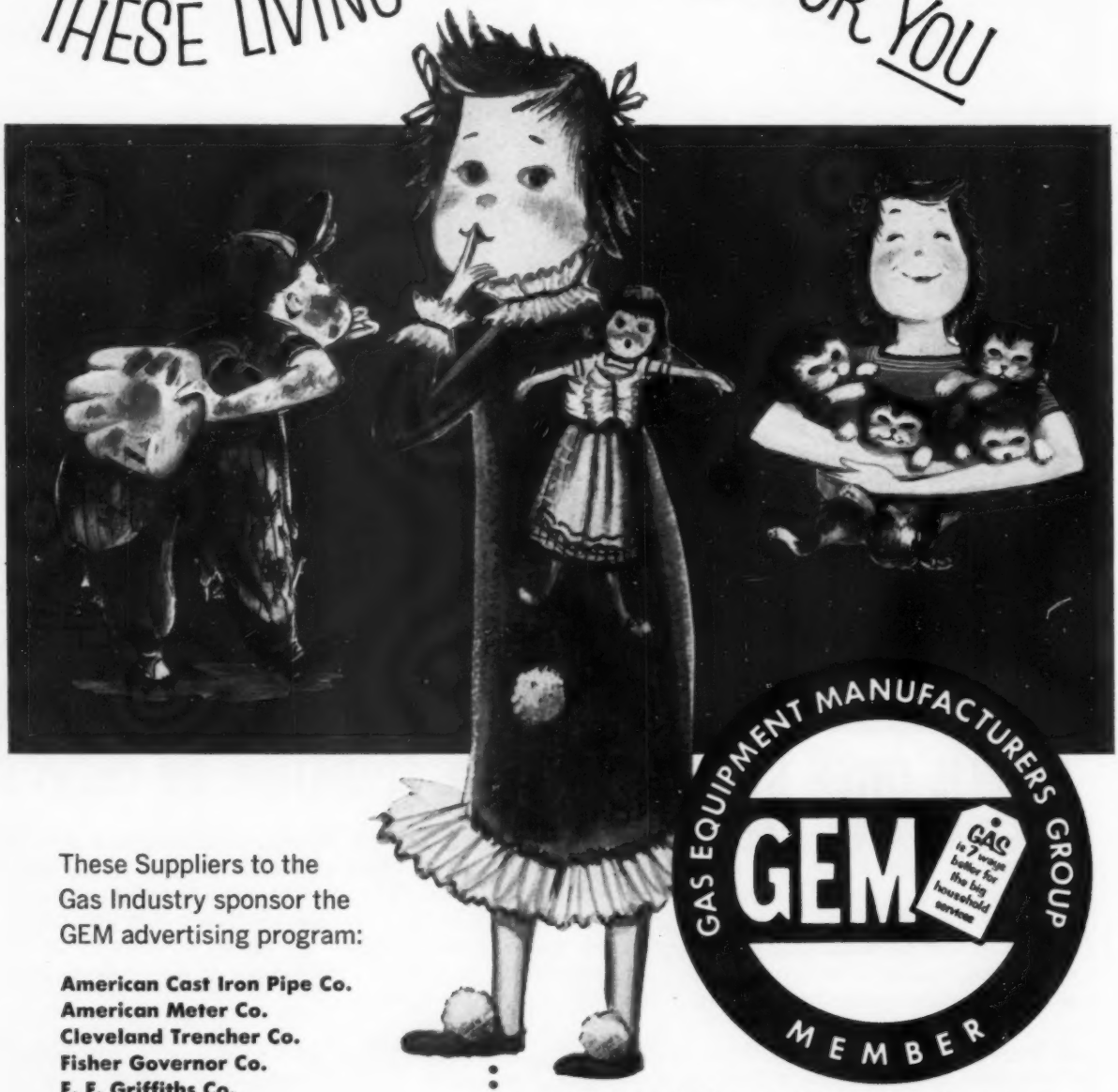
C. L. Owen, vice-president of GO Oil Well Service, Fort Worth, puts his faith and $15,000 worth of electronic equipment in his Chevy panel and sends it out on rugged oil field duty every day of the week. They used to have to pad the sensitive electronic recording panel to cushion out road shock and vibration. But not any more. Not with torsion springs soaking up bumps and jolts. Chevy's new ride is "made to order," according to Charlie Owen. "In our oil well locating operation we stay on the go anywhere, any time . . . and count on less breakage along with lower maintenance costs." The GO company goes for Chevy 100%.

■ They're speaking right up, these owners of '60 Chevrolets, talking about a new truck-and-tire-saving ride that leads to shorter trip times, too. Chevy's independently suspended front wheels step right over bumps, virtually eliminate most of the severe impacts that can wear out trucks and tires before their time. You profit by a big savings on maintenance; get a bigger daily work output because these trucks float you over rough roads with fewer slow-downs. New Chevy cabs are built to last longer, boost driver efficiency. There's more leg room, head room and hip room than ever before, new visibility that's greater by more than 26%, new foam-padded seat, new tougher construction features—double-panel roof, box-section door pillars and many more. Tough truck power that knows the most about saving money. Efficient short-stroke Chevy V8's with up to 230 h.p., 335-ft.-lbs. of torque. Or trucking's most widely used 6's, engines that do more work per dollar with time-proved, truck-built components. Look into it for yourself; Chevy's totally new working ability is at your dealer's right now. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

1960 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

THESE LIVING DOLLS WORK FOR YOU



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TECHNICAL TRENDS

By GUY CORFIELD

Line pipe while you wait

A machine, or portable "mill," has been developed in Europe, that makes pipe on the job as it moves along the pipeline right-of-way. It uses a ribbon of steel unwinding off a spool to make spiral formed tubing welded along the spiral both internally and externally. Several sizes of the mill are available which, through the range, can make pipe from 0.5- to 80.0-in. diameter with wall thicknesses from 0.125 to 0.625 in. The width of the strip steel, or perpendicular distance between spiral welds, can range from 2 to 48 in. Aluminum pipe has also been made.

Beyond mobility, other stated advantages of this process are: ability to produce pipe of any length, low inventories of raw material, very small scrap loss, easily adjusted to different pipe sizes, pipe perfectly straight and round, and fewer operators required than in a conventional mill. The process is assertedly in use on lines being laid in Europe and Africa but has not yet been introduced into this country. The U. S. representative is the Draim Division of David Douglas and Co., Inc., Manitowoc, Wis.

Finding leaks with laughing gas

According to a recent news item, Southwest Research Institute, San Antonio, Texas, has suggested using nitrous oxide, N_2O, commonly known as laughing gas, to find leaks in underground piping being hydrostatically tested. Nitrous oxide under pressure is very soluble in water, to about the same degree as carbon dioxide in "soda pop." And, like in soda pop, the gas will escape when pressure is released. The procedure would be to dissolve the gas in the hydrostatic pressure test water. If there was a leak the gas would escape, rise up through the ground, and be detectable by infra-red analyzer. It is claimed that a water solution concentration of 0.05 vol. of gas per vol. of water, and a leak rate of 2 gal. of water per hour, would release enough gas for ground surface pick-up.

N_2O can be purchased for about 32 cents per lb or 8 cu ft. It is not toxic, irritating, corrosive nor explosive. If a pipeline were being tested in sections, the pressurized solution could be conserved by pumping from one section to the next.

Liquid hydrogen

The gas chemist has a great respect for gaseous hydrogen. This is because of its wide range of flammability and potential explosiveness, rapidity of burning, and ability to escape and diffuse due to its extremely light weight. Therefore, he might shudder at the thought of storing, handling and using *liquid* hydrogen. It must be kept at a temperature of −423 deg F (only 37 deg F above absolute zero), at atmospheric pressure, to remain liquid. If the temperature rises and it evaporates, 1 lb of liquid could produce 4000 cu ft of explosive air-gas mixture.

Its use, however, is becoming more and more desirable to rocket and space ship engineers. When burned with liquid oxygen, 40 per cent more thrust is developed than with an equal volume of kerosene and oxygen. The latter combination is one of the most powerful so far used. Pound for pound, liquid hydrogen - oxygen actually gives twice the propulsion effect of kerosene-oxygen.

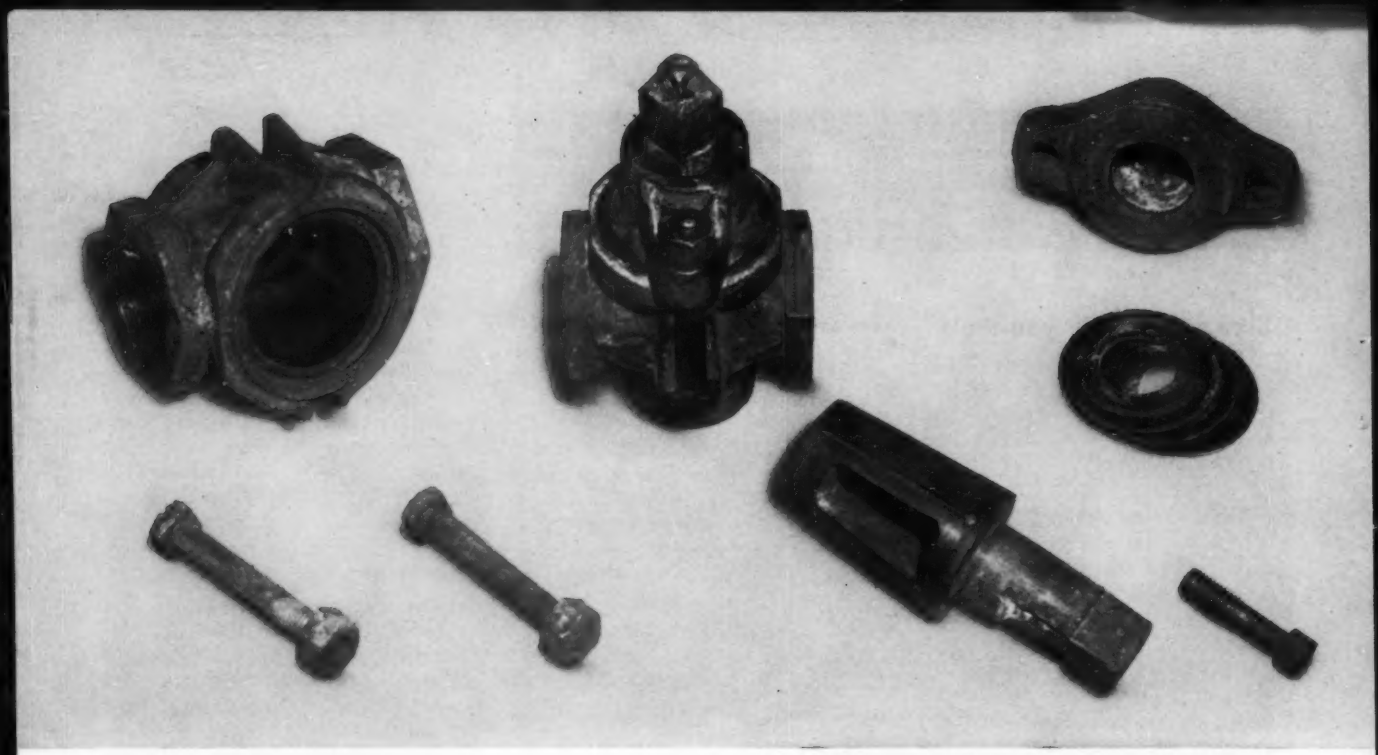
According to some research done by Arthur D. Little, liquid hydrogen is not actually as dangerous as might be supposed. They investigated what would happen if a quantity of the liquid escaped and gasified and caught on fire. It was found that unconfined helium gas-air mixtures burn rapidly but quietly and will not detonate except under rather extreme shock and within a narrow limit of gas-air ratio. Also hydrogen burns with very little flame color or radiation, so that persons in the vicinity of a conflagration would not be badly burned by radiant heat. The tests indicated that, assuming a 30-second exposure and equal volume of flame, a person could stand with safety 180 ft away from a hydrogen flame but would have to be 675 ft away from a hydrocarbon gas flame for equal immunity.

The U. S. Bureau of Mines, and several private companies including Linde, are producing liquid hydrogen in small amounts, and the National Aeronautics and Space Agency is asking for bids for a large plant. Linde claims to have developed a new super-insulation that is 26 times more efficient than standard vacuum insulation. It assertedly will permit storage of liquid hydrogen and oxygen for long periods with practically no loss by vaporization or need for auxiliary cooling.

Heat and pressure make industrial diamonds

After man's unsuccessful attempt for 125 years to make synthetic diamonds, General Electric's research laboratories reveal that they have at last developed a process. It consists of the simultaneous application of heat at 2700 to 4400 deg F and pressure at 800,000 to 1,800,000 psi to a cell in which carbon (graphite) is surrounded by a "catalyst" metal such as chromium, cobalt or tantalum. The metal forms a molten film surrounding the graphite, in the interior of which the diamond crystal forms and grows.

"Seed" crystals are not necessary. The formation is rapid and small diamonds, 80 mesh or less, will grow "in a few minutes" after the temperature - pressure levels are reached. By varying the temperature, both the shape and to some degree the color of the diamonds can be controlled, thus making it possible to tailor them to various industrial requirements.



Installed on caustic lines in 1930, these Rockwell-Nordstrom lubricated plug valves needed only cleaning before installation in new plant.

THE VALVES THAT WOULDN'T RETIRE

The Rockwell-Nordstrom lubricated plug valves shown above were two of dozens installed in 1930 on caustic lines at a process plant. When the plant was torn down in 1959, the valves were still in such good condition that they're being used on the same service in the new plant.

The above story is just one more example of the ruggedness of Rockwell-Nordstrom valves. Since they're sealed positively against leakage by pressurized lubricant and there are no exposed metal-to-metal seats, you get positive shut-off year after year. And, lubrication is preventive maintenance against the high cost of repairs, replacement and downtime. To get complete details on Rockwell-Nordstrom, the original and world's most complete line of lubricated plug valves, lubricants and accessories, write: *Rockwell Manufacturing Company, Pittsburgh 8, Pa.; Canadian Valve Licensee: Peacock Brothers Limited, Montreal, Quebec; Rockwell International S.A., Geneva, Switzerland.*

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One of the newest Rockwell Hypresphere lubricated spherical (full round opening) pipeline valves. Because it's lubricated, it will last the life of the pipeline.

WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

Political campaigns may mean trouble

POLITICAL propwash from the increasingly bitter national campaign contests is threatening to stir up some real trouble for the gas industry.

Coal industry drum-beaters are using the election jitters of many members of Congress as a lever to push forward their drive for the controversial national fuels policy. They're using the support they collect in other battles too, including the move to cut the gas and oil depletion rate.

The aim of both of these drives is to force the price of natural gas upward and to limit or if possible prevent the use of gas under boilers and in any industrial use at less than the often higher price paid by other volume users.

It's probable that neither of these campaigns will come to full fruition this year. But private talks with several congressmen indicate that the fired up coal interests are getting commitments this year which they'll try to turn into action next year or the year after.

If they can hold these commitments, there's a strong possibility that they will have the strength they need to win both these fights. And it's likely, congressional insiders say, that they'll have the votes needed to block any natural gas bill they don't like—which would be almost anything that the gas producers would bother to propose.

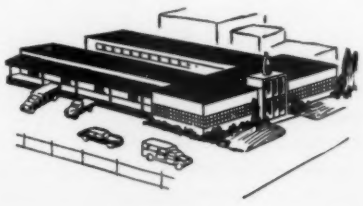
Coal state congressmen, already safely in the bag along with some consumer-area lawmakers for the carbon salesmen, are being reinforced with what some sources claim are substantial numbers of formerly on-the-fence politicians.

The first results of this determined and well-financed move to line up support by the coal industry will come this spring in the Senate. Congress this year will have to vote on at least one tax bill, designed primarily to close various tax loopholes. Opponents of the present gas and oil depletion rate say they'll try to tack on an amendment to this bill to cut the rate.

Political strategists say that unless the coal industry is convinced it can win in both the Senate and the House, however, it won't show all its strength—only enough to try to encourage others to join them next year. Thus, they may add only a half-dozen or so votes to the 30-odd they have notched in the past. But this probably won't be a true measure of their potential strength in a real show-down fight.

The battle over the national fuels policy proposal will shape up a little differently. The industry already is believed to have the first step solidly nailed down. This is the measure to create a joint Senate-House committee to study all fuels resources.

This committee—if all goes as the industry hopes—would in a year or two come back with a national fuels policy all drafted and ready for a congressional vote. Chances are that the industry won't push this final vote this year, but if it gets the support it wants, may rush the timing a little and push a show-down in 1961.



The national elections are likely to produce other actions which will affect gas industry officials. One strong possibility is that the public support to the payola and other probes will be turned into congressional action to pass new restrictions on the operations of independent regulatory agencies, such as the FPC.

The investigating House Commerce Committee, headed by Rep. Oren Harris (D., Ark.), has already proposed special new laws to cover the Federal Communications Commission and the payola problem. And it has had for some time the general outlines of new controls over these agencies. This is the type of proposal which is always welcome to the tub-thumping campaigners.

COST is again firmly inserted in gas producer price cases. Thus, independent producers, who have been fighting utility-type control, are back where they started.

Producers have been trying in the absence of legislation firmly shifting controls from a utility to a commodity standard, to soften the use of cost of service by the FPC in applying government regulation.

The FPC has generally agreed, and several times has attempted to use cost only as a factor or to simply note it and go on to other factors. Courts have consistently set them back.

Continued on page 38

Testing asphalt pipe enamels

There are differing opinions among corrosion prevention experts relative to the water solubility characteristics of asphalt pipe enamel. Here is what one manufacturer has to say on the subject. It is not his purpose, or that of GAS Magazine, to "plug" one type of material over another. We do feel that this discussion and suggested test will be of interest to many readers. And we welcome comment on the subject from anyone. (ED.)

A GREAT deal of confusion exists in the minds of many well qualified men regarding the water solubility, water transmission, and water absorption of quality grade asphalt pipe enamels.

The first suggestions that these alleged defects existed were taken quite lightly by asphalt technicans, who themselves knew better and assumed, incorrectly, that everyone else did. No effort was made to correct this misinformation and, over the years, the understandable thing happened: this premise became clothed as fact.

It has been only in the last few years that a concerted attempt has been made to approach this misunderstanding systematically and continuingly, with a documented, factual story.

This column will detail a test which is both simple and yet significant. Before going into the test, however, let's review for a moment certain physical and chemical facts about asphalts suitable for use as a high quality pipe enamel.

Asphalt in its very nature is totally immiscible and soluble in water only to an infinitesimal degree. This is likewise true of most petroleum derivatives as well as the residual asphalts themselves. There is no derivative of an asphalt crude by process of distillation that is in any way water miscible or water soluble, insofar as we have determined. Of the two leading pipe enamel materials, asphalt alone can make that statement, according to our technical advisers.

Asphalt has been used for so many years in such a wide spectrum of usages that, quite literally, the literature on performance values of this material is enormous. But, briefly, it is unthinkable that asphalts would be in world-wide use for so many centuries as the leading agent in waterproofing, damp-proofing and weatherproofing were such asphalts water soluble to any significant degree. Even the least informed of us, without leaving his desk, can jot down a dozen or more uses where asphalt is in direct, continuous contact with water, with weather, with dampness in any of its forms, still offering excellent protection and long lived performance.

When there are surface indications of water next to the pipe, or disbonding with water between the enamel and pipe, one or more of four conditions generally are at fault: (1) disbonding due to faulty primer, (2) cracking of enamel due to faulty formulation, (3) use of inappropriate, moisture - absorbent fillers or extenders in the enamel, (4) mishandling of the pipe itself.

The only scientifically sound reason a technician could have for asserting that a proper asphalt is soluble in water to any significant degree is in such instances where the asphaltic crude originally contained an excessive amount of salts, or if salts were added or developed during manufacture. In this event, and in further event that the crude was not de-salted or treated chemically, these salts would be retained in the residual oil resulting from refining reduction or distillation.

Should there be salts in any quantity thus remaining in the residual, water would be absorbed in large quantities. As a matter of fact, water would continue to be absorbed ad infinitum.

The fallacy of this condition, however, lies in the fact that none of the high salt content residuals are usable or fit in any way for quality asphalt pipe enamels. None fact, water would continue to be are used by reputable processors or manufacturers who are fully aware of this phenomenon. Residuals found to be best adapted for the protection of buried pipelines are those which are practically free of salts and uncontaminated in any degree.

Additionally, all refiners watch salts in crudes very closely as they are always highly corrosive. The injury by corrosion to equipment is far greater than the cost of removing the salts in the first instance.

And now for the test.

Do you have a hot plate available, which can be maintained at a temperature of about 150 deg for seven days? If not, can you secure the consent of your wife to use her oven, where a low temperature under boiling can be held for several days? This temperature, plus two mason jars, plus a sample of Gulf States # 434 Pipe Enamel and coal tar pipe enamel, are all that are required.

Continued on page 95

"National Supply wellhead design service is a big help in our storage well program"

says Dave Ellington, Chief Storage Engineer, Manufacturers Light and Heat Company

"A little over a year ago," says Mr. Ellington, "we started a program for new storage wellhead design and simplification. National's sales and engineering people worked closely with us to develop a wellhead that we could use in Manufacturers' and Home's storage fields. The special design presented by National is just right for our needs. It permits complete standardization and flexibility and it is usable for the variety of well conditions we have in different fields.

"National also designed a special fracturing head for this unit. It enables us to fracture both old and new wells at high pressures—easily and quickly.

"There's no doubt about it—National's wellhead design for our storage wells has saved us a lot of time and money."

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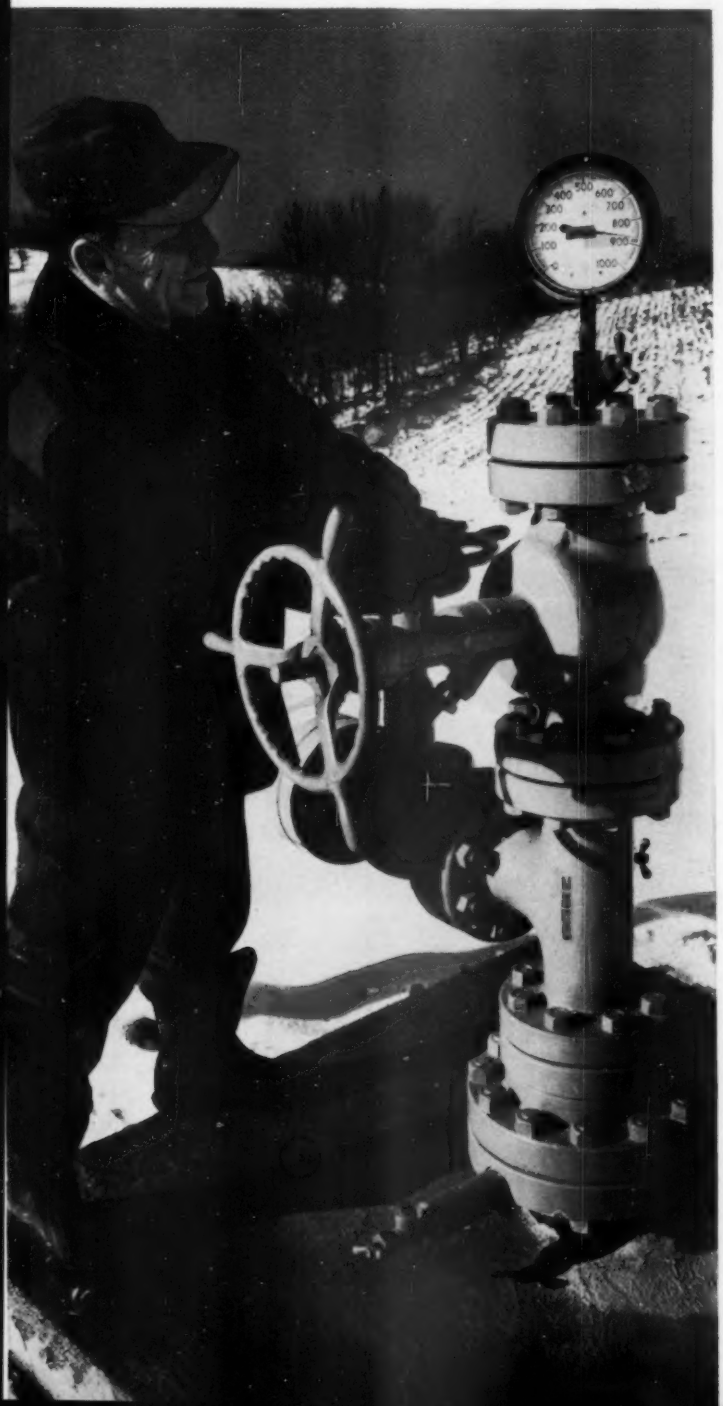

In service near Washington, Pa., this National wellhead was designed especially for the gas storage well requirements of the Manufacturers Light & Heat Company and Home Gas Company. Both companies are headquartered in Pittsburgh.

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MUELLER® NO-BLO® METHOD

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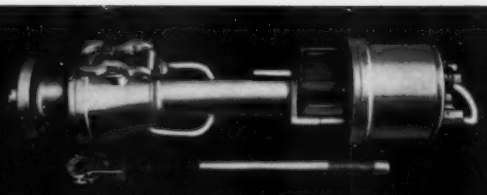


CH-6 DRILLING MACHINE

- . . . makes cuts from 2" to 6"
- . . . shell cutters designed for cutting any type pipe
- . . . up to 24" boring bar travel
- . . . for pressures to 1440 p.s.i. at 100° F.
- . . . for temperatures to 500° F. at 1250 p.s.i.
- . . . features automatic operation *without* supervision
- . . . automatic feed disengagement and overtravel protection
- . . . direct reading tool position and feed indicators
- . . . telescopic design for handling ease
- . . . self-adjusting boring bar packing
- . . . for power operation with air or gasoline engine drive unit
- . . . may also be operated by hand

H-17235 STOPPING MACHINE

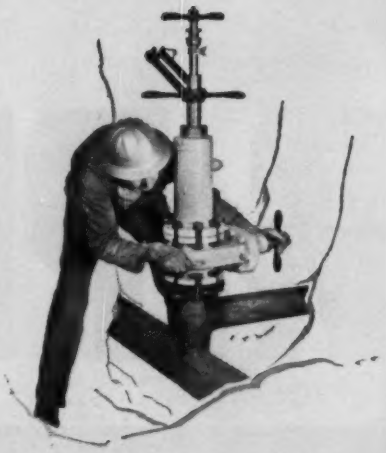
- . . . inserts and extracts plugs in 3" and 4" flanged tees, line stopper fittings and drilling nipples
- . . . for pressures to 100 p.s.i.
- . . . for temperatures to 250° F.
- . . . hand operated

These machines and fittings are just a small part of Mueller's complete system of No-Blo products — products especially designed for working with fluids under pressure.

These few simple operations are all that are needed to quickly connect a 4" lateral under pressure to a steel main with a No-Blo Flanged Tee.

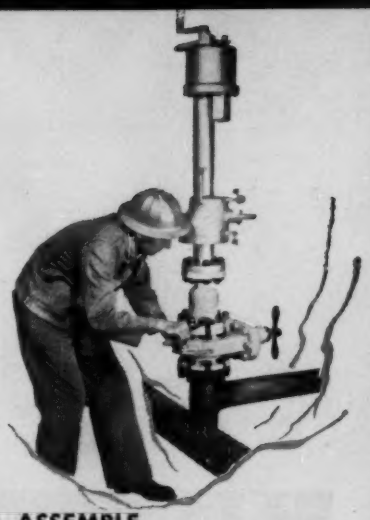
1. WELD

Remove cap and loosen plug. Weld Flanged Tee to main. Weld lateral to Flanged Tee. Complete lateral to first shut-off. Test welds with soapsuds. Bolt gate valve—hand tight—to fitting and open valve.



2. ALIGN

Attach alignment tool and completion plug to shaft of H-17235 Stopping Machine. Bolt machine—hand tight—to gate valve. Align machine and valve with fitting. Insert plug into fitting and tighten bolts. Mark position of machine on valve. Remove completion plug and machine.



3. ASSEMBLE

Bolt adapter to CH-6 Drilling Machine. Advance boring bar with rapid feed hand crank. Attach cutter arbor, pilot drill and shell cutter to boring bar. Retract boring bar to rearmost position. Bolt machine to open gate valve.

4. CUT

Advance boring bar until pilot drill almost contacts main. Test set-up for pressure tightness. Set amount of cut needed and engage automatic feed. Mount air motor on machine and open throttle. ("CH-6" will automatically make cut and disengage feed without supervision.) Lateral now in operation. Retract boring bar to rearmost position. Close gate valve and remove machine.

5. PLUG

Fasten inserting tool and completion plug to shaft of "H-17235." Bolt machine to gate valve in same position as marked. Open gate valve and insert plug solidly into top of fitting. Test tightness of plug with bypass valve. Release plug and remove machine and gate valve.

6. CAP

Position gasket on flange of fitting. Bolt completion cap firmly in place. Test entire set-up with soapsuds. Connection now completed and ready for backfilling.

Write for complete information and specifications.

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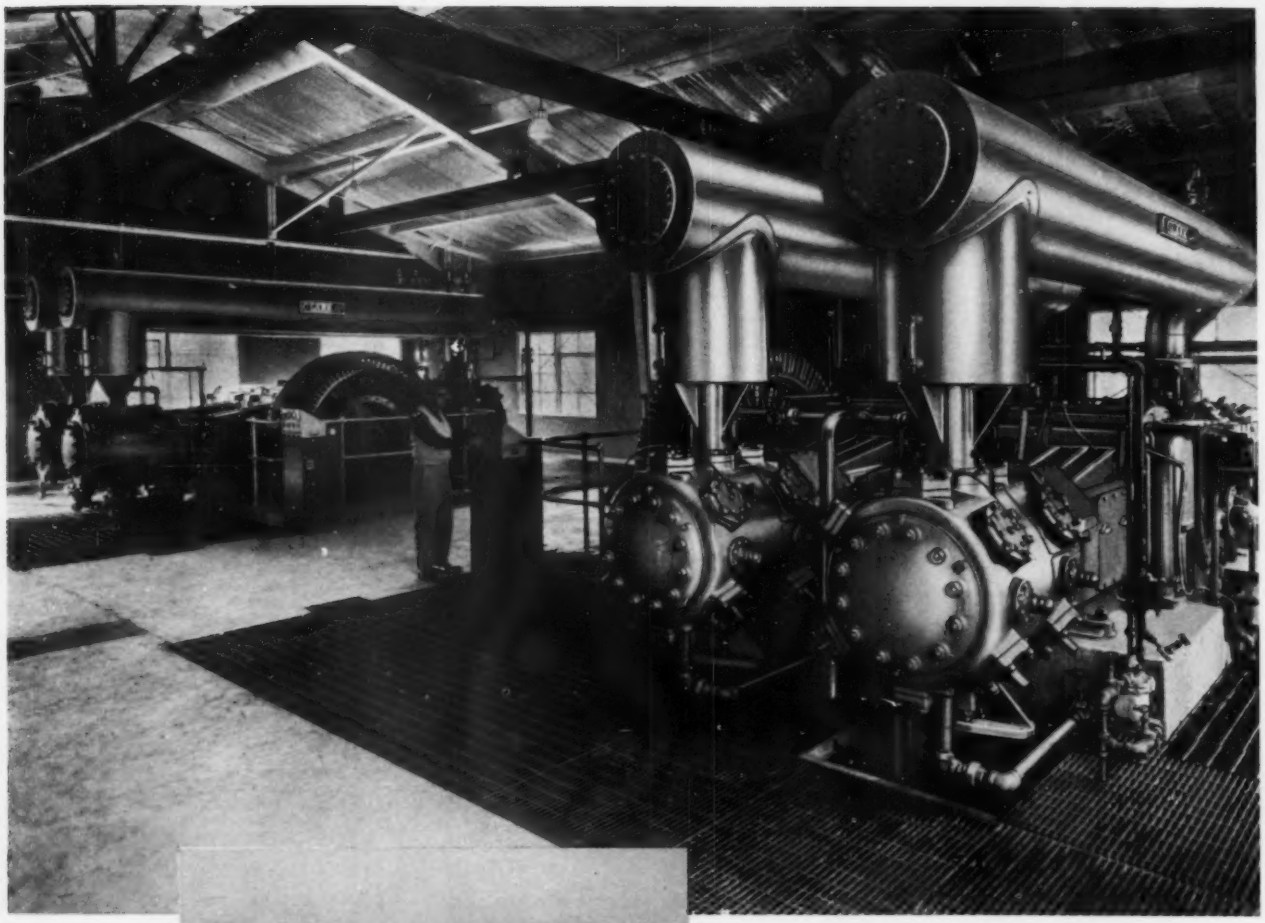

Clark Model CLRA-4 Balanced/Opposed Compressors are of overhung rotor design. Heavy shaft and crankcase design eliminates the need for troublesome outboard bearings.

The Dicks Creek Gas Plant of Cincinnati Gas & Electric Company, near Cincinnati, Ohio.

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The propane, vaporized by steam, is processed and blended with natural gas to achieve a Btu value approximating that of the original natural gas. Daily capacity of the plant is 50 million cubic feet.

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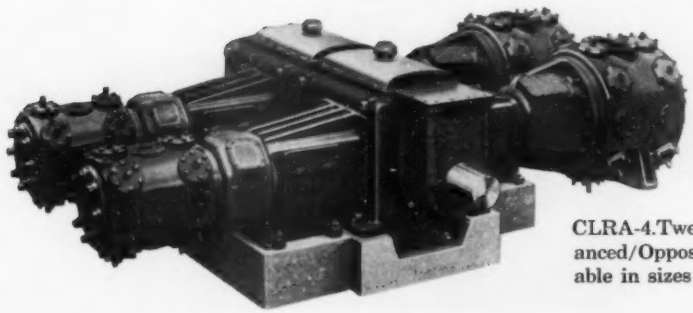
Compressors
Gas Turbines

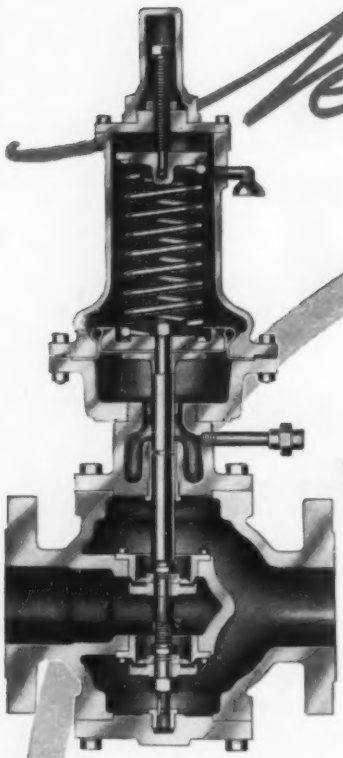


CLRA-4. Twenty-one models of Clark Balanced/Opposed Compressors are available in sizes ranging from 75-8000 bhp.

New in principle!

CHAPLIN-FULTON

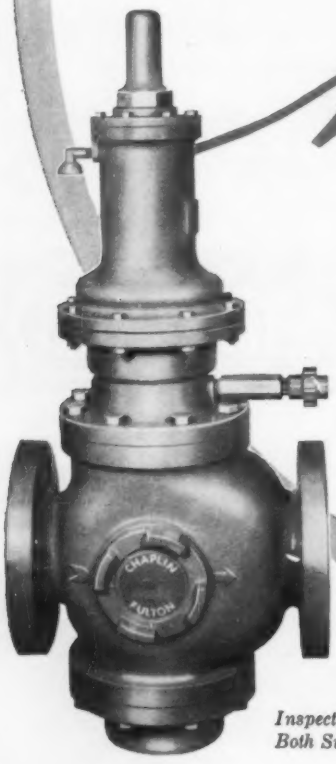
MODEL 441-57S
GAS REGULATOR



SIZE: 2"—3"—4"—6"
125 lb. iron—W. P. 175 psi
250 lb. ductile—W. P. 400 psi
Series 30 steel—W. P. 720 psi

Model 57-S, a simple spring loaded regulator, operates on a new diaphragm principle which will control accurately until the regulator is wide open. The outlet pressure "fall-off," typical of spring regulators, is eliminated—not by an uncontrolled velocity effect—but by a diaphragm which changes its size as the valve moves to give straight line control. For pounds-to-pounds service,—controlled pressures to 75 psi with same assembly.

New in design!



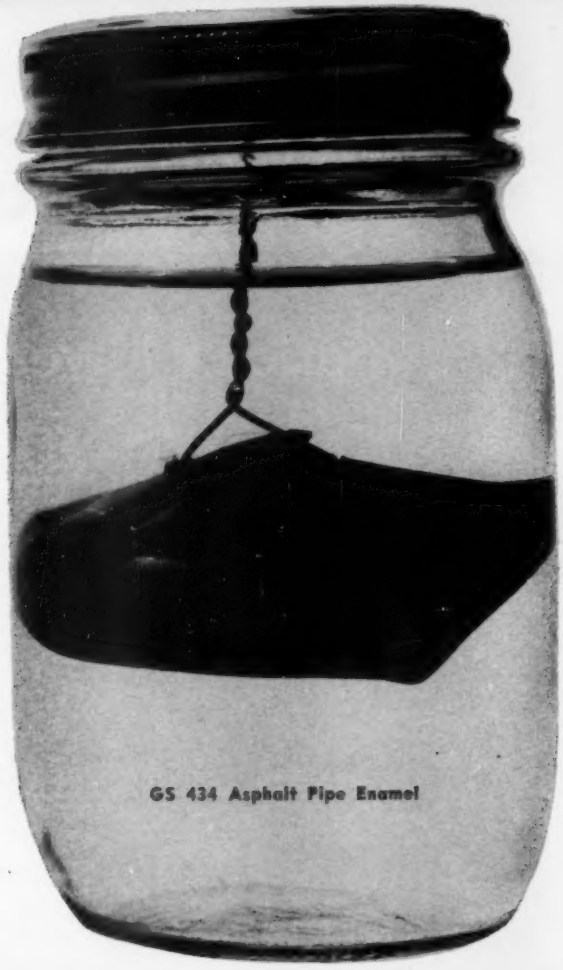
Inspection Plates Both Sides.

Also, a new body design—441—with gas exit areas greatly enlarged to prevent turbulence and increase capacity.
And to help in your visual inspection program—side inspection plates on *both* sides of the body have been included. Screwed-on with O-ring seal, they can be quickly removed and replaced—no gasket problem. Standard face-to-face dimensions now make the 441 interchangeable with other regulators.

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

59-2



WHICH IS MORE SOLUBLE?

Above these words is a photograph showing samples of a coal tar enamel, (left), and a sample of GS 434 Asphalt Pipe Enamel, (right). Both were exposed in mason jars to identically the same temperature for seven days. Water in the left hand specimen is cloudy. The water in the right hand jar, on the other hand, is crystal clear.

Our technical advisers write us that the cloudiness and discoloration of the water is indicative of solubility of the coal tar enamel.

GS 434 has a geuinely impressive laboratory and field performance record. We'd like to tell you about it. You'll be a better informed man after hearing the GS 434 story. Call Lloyd Bramble or Cecil Redding, at CApitol 4-2507, Houston, Texas, for details.

Gulf States

ASPHALT COMPANY, INC.

A DIVISION OF BRAMBLE INDUSTRIES

SALES AND EXECUTIVE OFFICES: MELROSE BLDG., HOUSTON 6, TEXAS CApitol 4-2507

FACTORIES: SOUTH HOUSTON • BEAUMONT • DENVER • NEW ORLEANS

AFFILIATES IN ALBUQUERQUE, NEW MEXICO • ARGENTINA • MEXICO • SPAIN

ANNOUNCING THE NEW

up to 30 mpg!

Totally new for *total* savings! Ford's new Falcon Ranchero delivers up to 30 miles on a gallon, yet its new 90-hp Six is geared to do a real job! There are lower costs for oil, tires, brakes, parts . . . nearly everything!

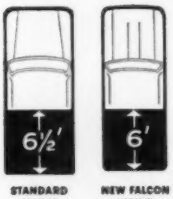
lowest priced* pickup!

The Falcon Ranchero is priced from $89 to $210 under competitive ½-ton pickups!* And that's just the start of your savings. Single-Unit construction saves on maintenance . . . it's tighter, quieter, with main underbody members zinc-coated against rust and corrosion. See your Ford dealer!

*Based on latest available manufacturers' suggested retail delivered prices with comparable standard equipment.

FORD Falcon RANCHERO

big 6-foot box!

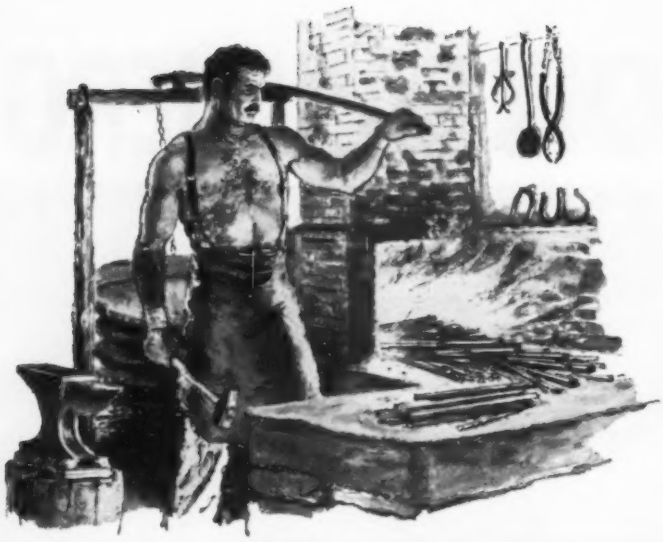


Load capacity is more than ample for most pickup hauls—nearly 7½ feet of load length with tailgate flat. And thanks to the low loading height, loading and unloading is faster, easier!

- Up to 30 miles on a single gallon of gas
- Up to 4000 miles between oil changes
- Diamond Lustre finish needs no waxing
- Low loading height
- Instant-lock tailgate opens, closes with a single, one-hand motion
- Roomy comfort for three passengers
- Styled to capture admiration

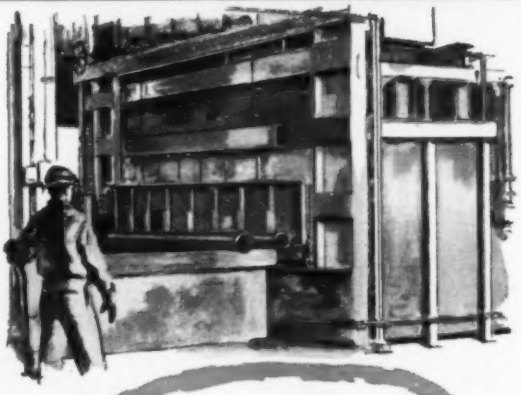
FORD TRUCKS COST LESS

LESS TO BUY... LESS TO RUN... BUILT TO LAST LONGER, TOO!



THE BLACKSMITH . . . legendary figure of other days, heated his metals in a crudely built forge.

BASIC...but better than ever today



TODAY . . . dependable gas supplies heat for thermostatically controlled heat treating furnaces such as used for our cast iron pipe.

Cast iron pipe's reputation for long life was won the hard way—by proved performance in the field.

Throughout the country today many cast iron gas mains, a century and more old, are still serving.

This outstanding record is the result of cast iron's inherent quality. Quality that we, for one, maintain at maximum levels by supervising every production step from mine to finished product.

You can depend on U. S. Pipe. It is quality-controlled in manufacture to insure top performance in the main.

SERVICE IS BUILT INTO CAST IRON

- **Standardized mechanical joints are bottle-tight for usual gas distribution pressures . . . and for all types of gas.**
- **Centrifugally cast pipe is tough, strong and uniform.**
- **Joint design allows for deflection during and after installation.**
- **Service connections are easily made**
- **Long life a matter of record.**
- **No shortages. Cast Iron Pipe is immediately available.**

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

U.S. cast iron PIPE
CAST IRON

GEM

1,117,400* like us await YOUR decision!

Someone is going to sell each of us a new heating plant this coming year. Obviously we have a broad choice of makes and fuels.

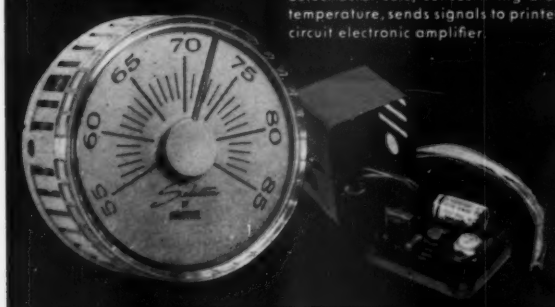
We want comfortable, even heat. Selectra-equipped gas furnaces offer this at little additional cost. Will we find Selectra on *your* product, or shall we look elsewhere? The decision is yours.

*Industry consensus on gas fired warm air furnace sales in 1960.

MAXITROL *Selectra*

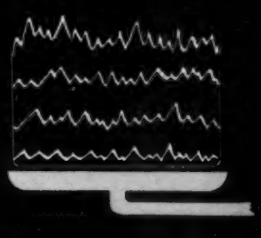
MAXITROL COMPANY • 12200 BEECH ROAD • DETROIT 39, MICHIGAN

Selectrastat sets, senses living area temperature, sends signals to printed circuit electronic amplifier.



Selectra valve does double duty as a regulator and as a modulator in response to power output of amplifier.

Selectra infinitely modulates flame from full input to ⅓ input. It's not just a "full fire —low fire" system.



INVESTING MONEY... OR JUST SPENDING IT?

Let's say you are considering pipe for gas utility expansion.

Your most important consideration is to make the best investment possible.

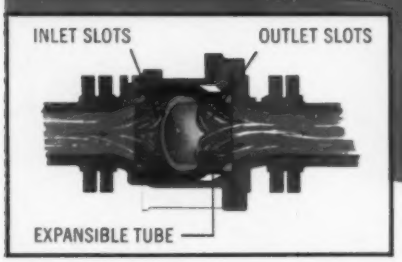
Utilities that select cast iron pipe are *investing* their money wisely, because an installation of cast iron pipe rarely requires major repairs for at least a century.

That's a big statement, but 62 American cities now using cast iron pipe gas mains over a century old will testify to it.

Rugged and durable, cast iron pipe withstands all the usual stresses to which underground pipe is normally subjected. And mechanical joints remain tight under normal distribution pressures.

CAST IRON PIPE RESEARCH ASSOCIATION,
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE



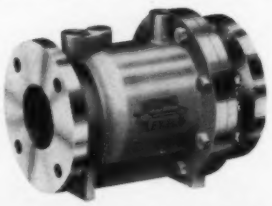
GROVE FLEXFLO

The world's most versatile valve has only one moving part, yet can be used for:

PRESSURE REDUCING
REMOTE CONTROL OPERATIONS
BACK PRESSURE CONTROL
AUTOMATIC SHUTOFF
MANUAL OPEN-SHUT FLOW CONTROL

A single, moving part—an expansible tube of tough, but resilient rubber—serves as both diaphragm and valve. Can't slam... the tube rolls on and off the core, assuring remarkably quiet operation. Can't stick or wedge open. The resilient tube seals around foreign matter... absolute shutoff every time. Simple design guarantees dependability and minimum maintenance. Highly sensitive with smooth, instantaneous response.

The Flexflo can be adapted for a wide variety of services. May be self-operated or used with electrical, pneumatic or hydraulic-actuated pilots. Can handle gases, water, most petroleum products, and numerous other liquids... available in sizes 1" to 12" ... working pressures to 1500 pounds.



GROVE VALVE and REGULATOR COMPANY
A Subsidiary of Walworth
65th & Hollis Street, OAKLAND 8, California
HOUSTON 27—3203 Mercer St. • LOS ANGELES 6—2559 W. Olympic Blvd.
ODESSA • TULSA • DENVER • CHICAGO • NEW YORK • DALLAS • PITTSBURGH
FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • LONGVIEW, TEXAS
In Western Canada: GROVE VALVE LTD., EDMONTON

5450

NEW!

Now, a loader and backhoe worthy of the Fordson Power Major Diesel

We'll match the performance, price, productivity, fuel economy, ease of servicing and overall dependability of this new Fordson Power Major package against any similar tractor-loader-backhoe on today's industrial market.

Granted, there's little gamble in this challenge. Fordson diesels long ago won their vote of confidence from tractor users all over the world. The new Ford 2500 lb. Super-Duty loader and Ford 14′ backhoe are basically the same heavy duty units engineered for the Ford Industrial tractor — equipment which has been proved while handling some of the toughest industrial jobs to be found anywhere. Phone your Ford Tractor and Equipment Dealer for a demonstration!

Ford Motor Company

NEW!

Fordson's power, weight and economy teamed with Ford's top producing loader and digger

The Fordson Power Major is the newest, most powerful version of the world's first mass-produced tractor . . . traces its origin back to the first Fordson of 1917. During those many years of improvements, Fordson has become a buyword for steady, dependable tractor power and unmatched fuel economy—a gallon an hour or less under full load, according to many owners. Now, for the first time, you can buy a tractor-matched, Fordson-size loader and backhoe. And what a production team it makes!

The loader has 2500 lbs. rated lift capacity, 5500 lbs. breakaway capacity, 22-degree bucket rollback, 3″ below-grade digging and ⅝ to 1 cu. yd. tread width buckets. The same type rugged subframe and hydraulic system mounts and powers Ford 12′ or 14′ backhoes. The largest of these, shown above, is in a class by itself and has no competition except for big, specialized rigs. Why not phone your Ford Tractor and Equipment Dealer right now for detailed specifications?

TRACTORS AND EQUIPMENT FOR 101 INDUSTRIAL JOBS

INDUSTRIAL TRACTOR AND EQUIPMENT DEPARTMENT, FORD MOTOR COMPANY, BIRMINGHAM, MICHIGAN

BRAND

U-COTE

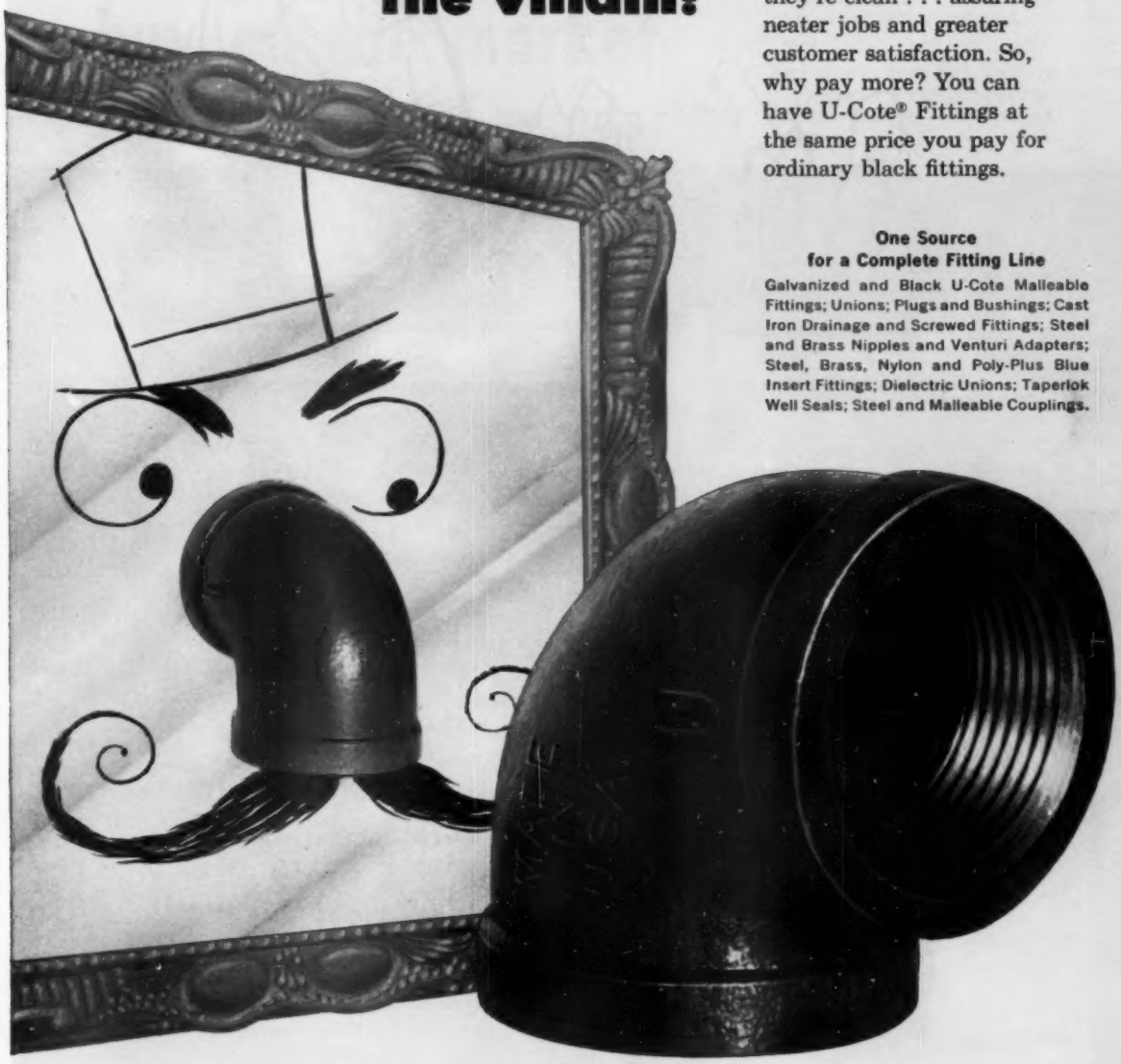
...will never be the villain!

U-Cote® black fittings—manufactured *exclusively* by Union Malleable—will never be the villain in the drama of "Rust and Corrosion," or, "Who Made the Mess".

U-Brand U-Cote® *will not* rust or corrode . . . these shiny, black coated fittings are easy to handle because they're clean . . . assuring neater jobs and greater customer satisfaction. So, why pay more? You can have U-Cote® Fittings at the same price you pay for ordinary black fittings.

One Source for a Complete Fitting Line

Galvanized and Black U-Cote Malleable Fittings; Unions; Plugs and Bushings; Cast Iron Drainage and Screwed Fittings; Steel and Brass Nipples and Venturi Adapters; Steel, Brass, Nylon and Poly-Plus Blue Insert Fittings; Dielectric Unions; Taperlok Weil Seals; Steel and Malleable Couplings.



BRAND

The Union Malleable Manufacturing Company

Ashland, Ohio • Vernon, Calif.

Shipping Depots in Principal Cities Assures Overnight Service

victimizing vegetation?

Leaking bell-and-spigot joints can ruin your public relations efforts. Vegetation damage means unhappy customers . . . unnecessary expenses. It puts pressure on your profit picture.

To solve the problem of dried out bell-and-spigot joints, gas utilities have turned to CARBOSEAL Brand Anti-Leak. By swelling the jute and hemp fibers as much as 44 per cent of their dry volume, CARBOSEAL Anti-Leak can eliminate leakage . . . with an estimated effective life of up to 25 years!

CARBOSEAL Anti-Leak is easy and inexpensive to use. Find out how other gas utilities have profited from this treatment. Write today for the booklet "Stop Gas-Main Leakage with CARBOSEAL Anti-Leak" and the 16 mm. color-sound motion picture "CARBOSEAL Anti-Leak Stops Gas-Main Leakage" . . . address Department B.

UNION CARBIDE CHEMICALS COMPANY

CARBOSEAL ANTI-LEAK

UNION CARBIDE

30 East 42nd Street, New York 17, New York

In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal

The terms "Carboseal" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

P-57-0881

JAEGER ROTARY "75"

best small compressor buy on the market

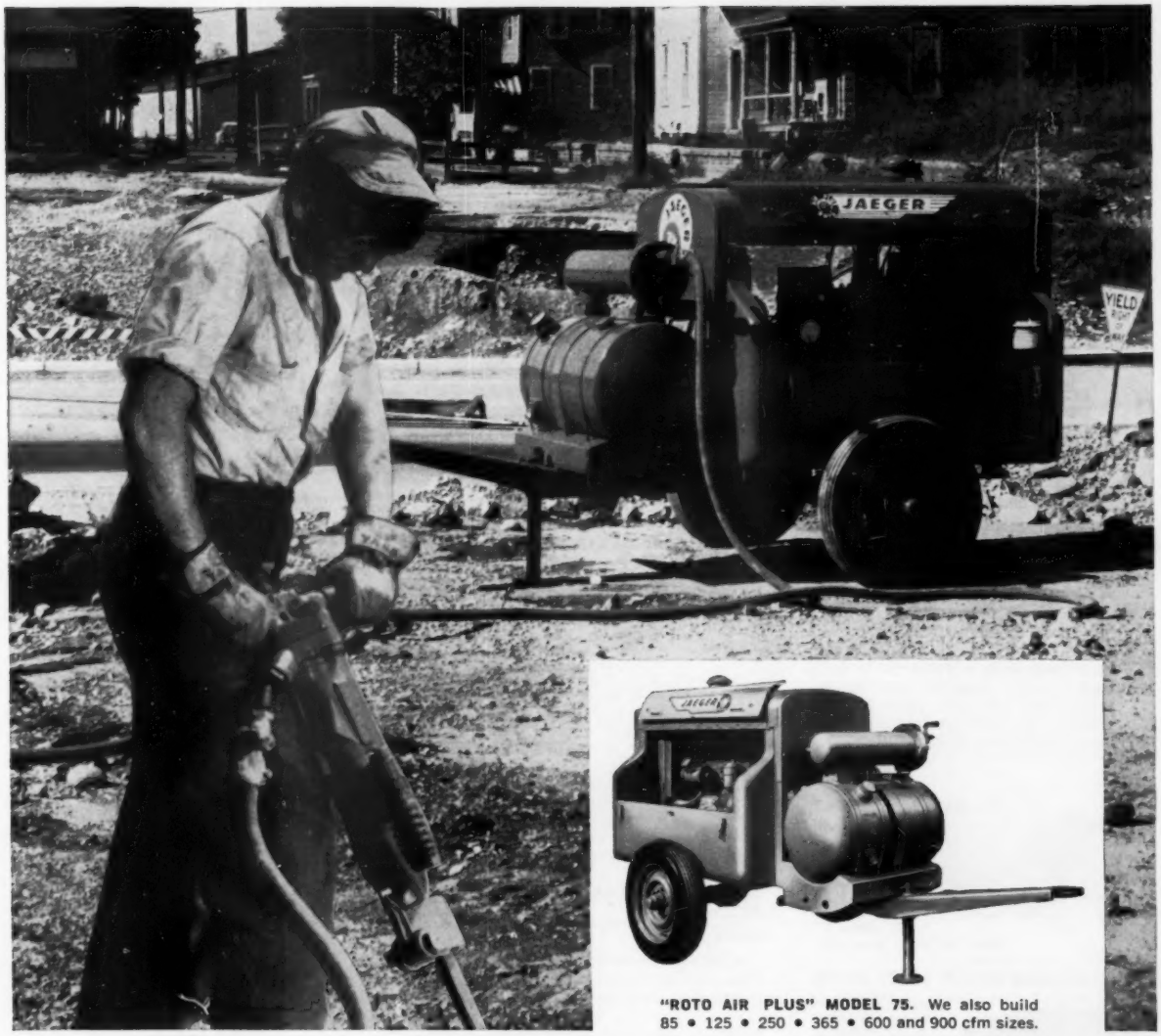
Costs much less than an "85" and is a better size for "one breaker" work.

Runs a heavy 80 lb. breaker at top efficiency (90 psig at the tool).

Always easy to start, because it's a rotary. No piston drag. Also smoother, cooler running than any reciprocating compressor.

Fully equipped with automatic blow-down valve; tool boxes big enough for full set of tools; spring-mounted, easy-trailing truck.

Save money, save fuel, speed your work ... Ask your Jaeger distributor for price and specifications — or write us.



"ROTO AIR PLUS" MODEL 75. We also build 85 • 125 • 250 • 365 • 600 and 900 cfm sizes.

THE JAEGER MACHINE COMPANY, 661 Dublin Avenue, Columbus 16, Ohio

AIR COMPRESSORS • CONTRACTORS PUMPS • CONCRETE MIXERS • PAVING MACHINES

YOU ASKED FOR IT!

the NEW DAVIS Self-Propelled T-66 TRENCHER

is built to your specifications

*Pat. Pending

features **Positive Traction...Hydraulic Variable Speed Drive Convenient Control...Virtually Effortless Operation**

Here's the finest, most advanced utility trencher available. The Davis T-66 has been designed and produced after an exhaustive survey determined the features users really wanted. Every one of its 1350 pounds is packed with performance to handle 9 out of 10 jobs with such efficiency and economy that you're bound to make more profit. And, it's priced far less than you would expect.

Positive traction, accurate speed control, and distribution of power where you need it is obtained through the use of tracks and a variable speed hydraulic drive. Boom is operated hydraulically for depth control, and it has a built-in pre-loaded shock absorber which cushions the shock but doesn't absorb the power. Everything is designed for the operator's comfort and convenience — requiring very little skill or effort. It digs 3" to 4" wide to 66" deep; or 12" wide, 30" deep and at varying widths and depths in between. Only **two tooth combinations** are required to let you **dig** at all widths. It trenches from 1-ft. to 12-ft. per minute depending upon soil conditions. It is compact, only 37" wide. The Davis T-66 is quality built in every part. It pays off in 33 ways!

ASK ABOUT ITS 90-DAY UNCONDITIONAL GUARANTEE

DOES ITS OWN BACKFILLING

The Davis T-66 has a low-cost, well designed, hydraulically controlled angle backfill blade. The T-66 has two-speed drive with instant forward and reverse, powered steering, independent left and right positive clutches and disc steering brakes for maneuverability in backfilling.

the DAVIS PUP TRENCHER digs by itself

Self-propelled by positive 6-speed winch drive. Digs 2" to 3" wide to 36" deep; 4" wide, 18" deep. Low cost.

the DAVIS HUSTLER UTILITY TRAILER

carries T-66 and numerous other items. 2000 lb. capacity, 48" x 84" deck. Has low center of gravity and load equalization.

DAVIS MFG. INC.

1308 South McLean Blvd., Wichita 13, Kansas

Tell me more about the Davis T-66____ Davis Pup____ Davis Hustler Utility Trailer____

Please send literature and name of distributor.

NAME_____

ADDRESS_____

TOWN_____ STATE_____

T6-60-3

Washington • *Cont'd.*

from page 17

Now, the FPC is apparently reading the handwriting on the wall. As a result of last year's Catco decision, the FPC now is using cost to meet the high court's order that initial price must be supported by "substantial" showings that it is required by public "convenience and necessity." The FPC applied the test in approving permanent certifications to 17 independent producers to sell 100 MMcf of gas a day from the Aneth field to El Paso Natural Gas Co.

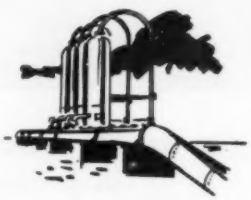
The FPC also notes that the high court ruling will make it necessary to make certain that the initial prices thus approved will not raise prices or trigger higher prices in existing escalation clauses.

In approving the Aneth sales, the FPC reduced the proposed initial price from 20 cents a thousand to 17.7 cents, contending the producers had failed to justify the 20-cent price.

The FPC turned down El Paso's arguments that the proposed price was the result of arms'-length bargaining. It ruled that while it might not trigger escalation clauses in the area, it would raise the floor for future bargaining and thus tend to increase prices, including El Paso's.

In the recent past, the FPC in similar cases has tended to approve certificate applications without bearing down too hard on the initial price. Prices were set in future rate cases.

Commissioner Arthur Kline, supporting the decision with some hesitation, noted that the 17.7 rate was no more supportable than the 20 cent rate, and contending that the FPC should have based the initial price on the evidence as presented, until a full rate hearing were held.



Backfilling for Pacific Gas and Electric Co., near Hayward, California

JOHN DEERE cuts backfill time with "on the go" blade control

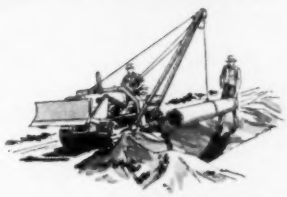
Complete one pass along the trench, and you can swing the blade as you turn for the clean up! That's one big reason operators like this easy-to-handle 64 All-Hydraulic Bulldozer.

Hydraulics control tilt, lift, and down pressure, too—right from the driver's seat. Direction reverser saves unnecessary shifting, cuts operator fatigue as well.

Diesel or Gasoline Power

You can get a John Deere 64 Bulldozer with either Diesel or gasoline power—whichever fits your needs—and all units can be financed confidentially through terms of the John Deere Credit Plan. For detailed information see your John Deere Industrial Dealer or write today.

John Deere Industrial Division, Dept. 1883, Moline, Illinois



John Deere Sideboom handles 4000 pounds 4 feet from boom pivot. Pipe bender attachment available.

Center-mounted or 5-position, new John Deere Backhoes dig to 13 feet, 6 inches.

JOHN DEERE *"Specialists in Low-Cost Power with a Heavyweight Punch"*

NEXT STOP... BAY BOTTOM!

American Molox Ball Joint Pipe Specified for Gas Installation

"Our experience with underwater installations caused us to select Cast Iron Pipe . . . AMERICAN Molox Ball Joint pipe," says one distribution engineer for an outstanding West Coast gas utility. The above view shows workmen assembling 10" AMERICAN Molox Ball Joint pipe on board the construction barge, part of a 3,500-foot underwater gas supply line. The 96-foot sections were lowered with the aid of a strongback for assembly beneath the surface.

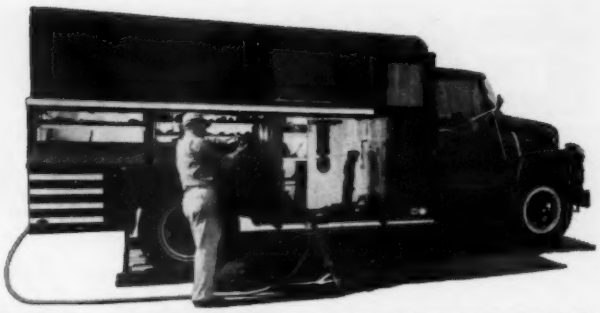
Specify rugged AMERICAN Molox Ball Joint pipe for river crossings and other difficult underwater installations. Molox pipe affords maximum installation economies because it is easily adapted to several installation methods: It can be floated or pulled across streams, or can be installed directly on the bottom from a barge. Once laid, it remains bottle-tight at any angle. The joint is designed for deflections up to 15°.

Before "plunging" into underwater pipe installations, consider these and many other advantages of AMERICAN Molox Ball Joint pipe. Write for free illustrated catalog.

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM ALABAMA

SALES OFFICES: Chicago
New York City — Kansas City
Dallas — Minneapolis — Denver
Pittsburgh - Orlando - Cleveland
Birmingham

Ready For The Routine—



—or Emergency

Emergency or routine—it makes no difference. Men, material—and power—are needed on the job.

The Holan 2236-3 Air Compressor Body with Crew Compartment is designed and built to carry all three to any gas construction or maintenance job.

Built of high tensile steel, this Holan Air Compressor Body can be mounted on any chassis with 102" CA dimension. The four-man crew compartment is an integral part of the body. The air compressor unit is located in the compartment directly behind the crew compartment.

Holan design leadership and quality construction are found throughout the Air Compressor Body. Compartments for carrying jack hammers, tapping machines, paving breakers, tampers, fittings, rubber goods, gas masks, hose reels, pipe, ladders—everything needed on the job—are conveniently located in this rugged body.

Write us today—or call your Holan Field Representative—for more information about Holan Air Compressor Bodies.

Holan Corporation, 4100 West 150th St., Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

Let Pipe Line Service carry that load!

Coating and wrapping facilities located near major pipe-producing areas provide buying flexibility, uniform protection

Because PLS plants with their vast storage areas are so strategically located, your pipe buying procedure can be greatly simplified . . . a load of detail lifted off your shoulders. You order from the desired pipe mill, specify delivery to the PLS plant serving the area, and we take it from there! There's always room at our 150 acres of plant sites to store your pipe until the exact time of need. Pipe can be released for processing and be on its way to the project in a matter of a few days. Savings in time often add up to weeks when plant-applied coatings are specified. Delivery of PLS coated and wrapped pipe is assured WHEN you want it, where you need it. So, let PLS carry that load for you. Call our nearest representative and get all the details.

Sales offices at all plant locations... and Atlanta, Georgia; Houston, Texas; Lincoln, Nebraska; Syracuse, New York; and Dallas, Texas

GEM

PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for over a quarter century

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

GAS

APRIL 1960

Fig. 1. No more smeared, wet meter readings for United Gas with its new "little black box."

The changing face of meter reading, data processing, and billing

By EDWIN D. NUTTALL
Electronic Section Supervisor, Research Department
United Gas Corp., Shreveport

THIS is 1961. Mrs. Neighborly Jones, one of the gas company's oldest customers, always worried and fretted in wet, rainy weather about the meter reader's health and the fact that his meter book would always get wet and smeared from the rain. On these days she always watched for John, the meter reader, to come by so she could invite him in to dry off his meter book. Of course, while waiting for the meter book to dry out she always had a cup of fresh coffee and a cake she knew John was particularly fond of ready for him.

One especially rainy day in Houston when John was reading the meter she noticed that instead of stooping over trying to shield his meter book or cards from the weather and at the same time mark down the readings, he had a different pose. Instead of a meter book or box of cards John was holding a small black box in one hand and turning some knobs on it with the other. He was almost grinning as he squinted at the meter through the drizzle (Fig. 1).

Bursting with curiosity Mrs. Neighborly could hardly wait to open the door and tell John that she had some hot coffee and cake ready for him. When John came in he carefully hung his raincoat on the porch in his usual manner and started to hang the little black box along with it, but noting the eager expression on Mrs. Neighborly's face he brought the box inside. Mrs. Neighborly outdid herself in pouring coffee and fixing the cake as she looked at the little black box. On the front of the box (Fig. 2) she could see some knobs sticking out, some of which were flat and seemed to have a different finish on each side. One was round with a small button protruding from it. John, noting her curiosity and wanting to tease her a little, waited until she was about to blow her pilot light before he nonchalantly said:

"Oh! by the way, Mrs. Neighborly, have you heard about our new meter reading system?"

Of course, Mrs. Neighborly hadn't, so after telling her how good the cake and coffee was John picked up the little black box and said:

The following members of United Gas Corp.'s research team played a most important part in the development of the meter reader's recorder: R. W. Bains, John R. Davis, A. M. Randolph, and W. C. Tomerlin.

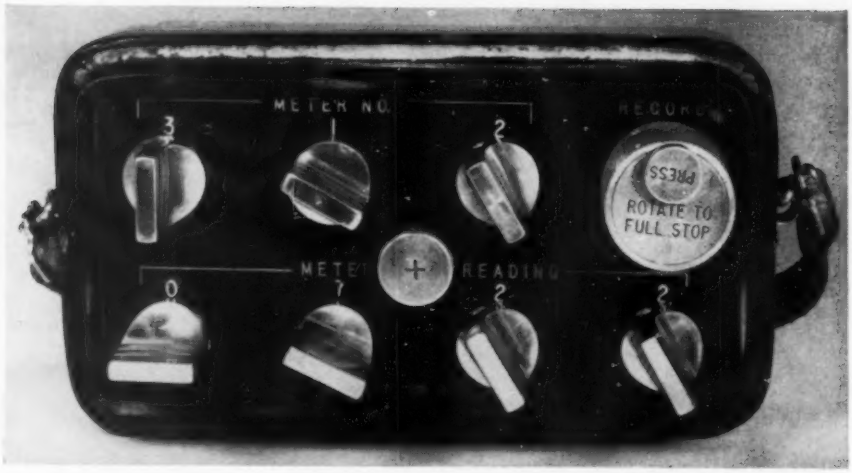


Fig. 2. Front of box, showing knobs to identify customer number (top left); recording button (top right), and meter reading knobs (bottom).

"Mrs. Neighborly, you know how difficult it has always been for us to keep our meter books dry and keep the readings clear so that no one would make a mistake and cause you to get an incorrect bill. Later, when we gave up the meter books and started using the cards that we had to mark with a special pencil, we had the same problem of keeping the readings from becoming smeared in rain and fog. In the summer we also had trouble with smears caused by perspiration. This has been a problem with us ever since we have been reading meters. Since our company is continuously trying to improve its service to its customers and improved accuracy is definitely part of this service, our research department developed a completely new system for reading meters and adapted it to computation and handling by data processing equipment, which you have probably heard described as 'electronic brains.'

"The little black box you see here, is, as you noticed, waterproof for all practical purposes. Under this cover in the back of the box is a small tape recorder which uses ¼-in. magnetic tape just like the tape your son uses on his Hi-Fi Stereo system (Fig. 3). Instead of using just two tracks like the stereo system this recorder uses four tracks, and, instead of music, a special code is recorded on the tape. When I read your meter I first adjust the three flat knobs at the top (Fig. 2) to a number code that corresponds to your customer number. I then adjust the four flat knobs at the bottom to the numbers which agree with your meter reading. After checking the accuracy of the reading setup by noting the numbers appearing in the little windows I press this little button on the round knob. This releases the mechanism allowing me to turn the knob just one turn. As I turn this knob these numbers are recorded on the tape. At the end of my day's work I turn in the recorder at the office. There the tape is removed and placed on a tape playback unit similar to the one your son uses for his hi-fi. This unit plays this tape into the computing system where your bill is computed and printed out in the form you are familiar with. It is mailed in the normal manner and in due time you receive it and pay for it. The entire operation is automatic from the time the tape is placed on the interpreter unit through the printing of the bill."

Let us now leave John enjoying a second piece of cake and more coffee as Mrs. Neighborly exclaims over the new device so that we can look at the technical and economical advantages of the new system.

THE meter reader's recorder and its associated components were developed in the research laboratory of the United Gas Corporation in answer to a request made by the director of research, Mr. D. T. MacRoberts, that we find a more accurate means of recording meter readings in a form easily adaptable to automatic data processing and computing through printing of the final bill. The meter reading system developed is a data acquisition system for an automatic computer and consists of three basic components (*Fig. 4*). These are the little recorder or recorders, an accessory table where all of the tapes from the different routes are spliced and reeled together for handling, and a playback or interpreter unit (*Fig. 5*) which changes the recorder code to computer language and reads it into the computer. Under present plans these systems should be available in 1961.

In our initial effort in this problem, tape was motor driven and recording was accomplished by conventional a-c methods using transistorized oscillators and amplifiers. A printed circuit board matrix was made up in such a manner that when the button corresponding to a selected digit was pressed the recording circuits were set up and the digit recorded in binary coded decimal code as the motor moved the tape forward. Limit switches were used to stop the tape travel after the reading was recorded. The essentials for getting this data into a computer were developed at the same time.

This model, completed in about six weeks, was shown to a number of people in our distribution division at one of their meetings. Comments and sugges-

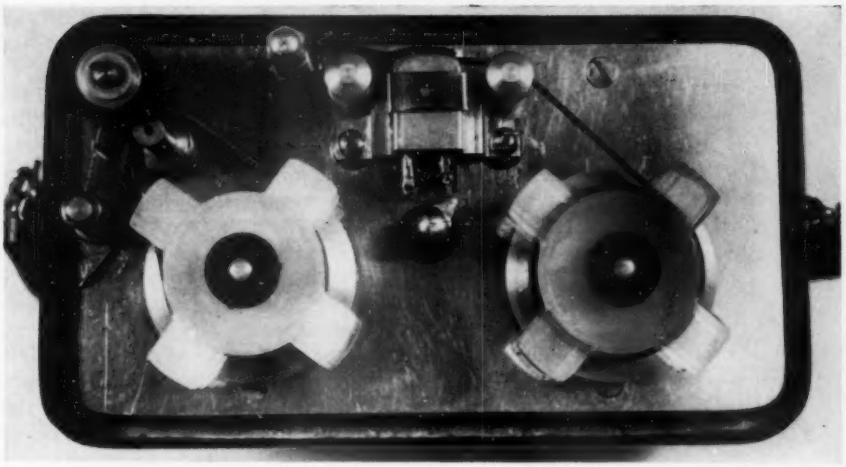


Fig. 3. In the back of the box is a small tape recorder which uses 1/4-in. magnetic tape.

tions were carefully noted. The unit weighed several pounds. Since the basic concept had been well received by the distribution people and others, their suggestions were incorporated in the development of the recorder shown in *Figs. 2 and 3*. This model uses a four-track, in-line recording head developed especially for the project by Joseph Dundovic of the Nortronics Co. It is manually operated. *Fig. 6* shows the unit out of its case.

The entire power plant consists of a single penlight battery. The circuit diagram is shown in *Fig. 7*. Looking down on *Fig. 6* (top), we see at the left the operate or read-in knob which is used to rotate the contacts of the interrogation switch and to drive the tape by the capstan shown under the pressure roller (bottom left), during the recording process. The three digit switches for setting up the customer number, and any computer instructions, etc., are on the top of the recorder to the right of the read-in knob. Not so clearly shown but identical are the four switches at the bottom of the recorder which are used for setting up the meter reading. The tape payout reel is shown at the bottom right. The tape guides, pressure pad and recording head are shown bottom center and the take-up reel is shown under the capstan drive on the bottom left.

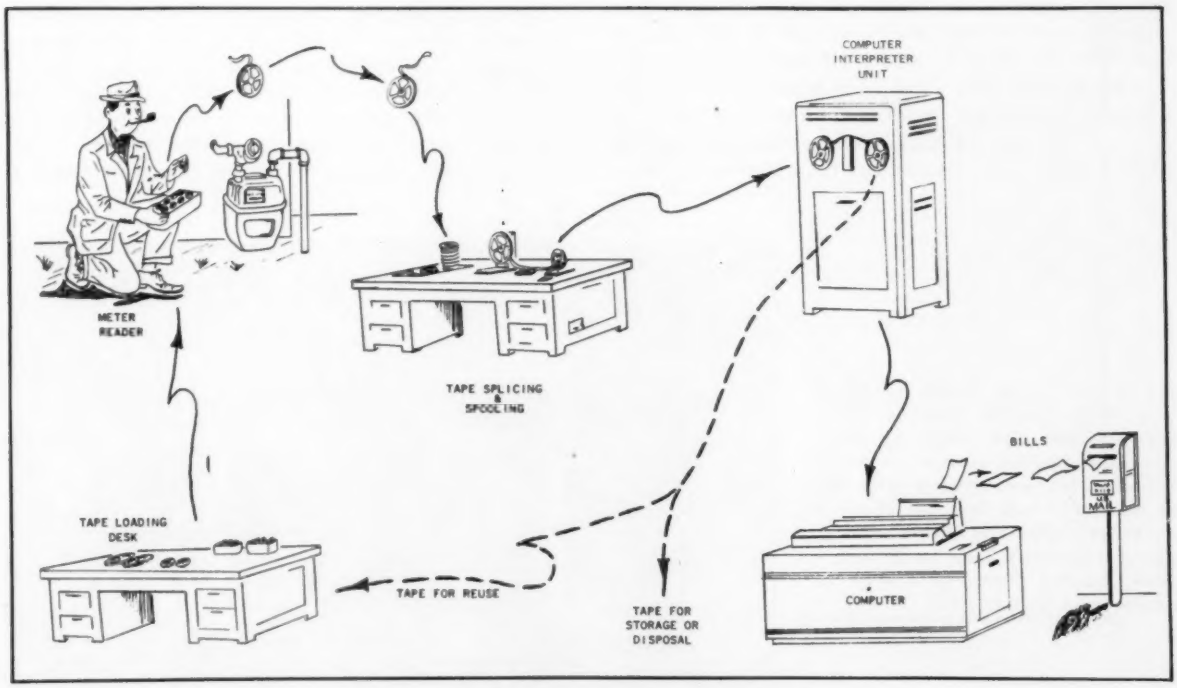


Fig. 4. Basic components of meter reading system consist of the recorders, an accessory table, and a playback or interpreter unit.

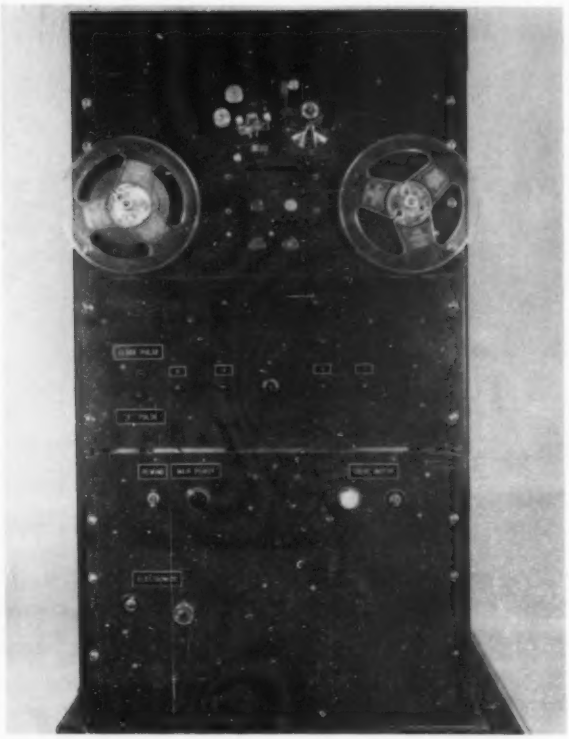


Fig. 5. Playback or interpreter unit.

In practice, an operator in the office would load a reel of degaussed tape on the payout reel hub, feed the end over the head and under the pressure pad, over the capstan and attach the end to the take-up reel. With the digit knobs set for zeros, several word lengths are recorded. This is as presently used with a system tailored for use with the Datatron 204 computer. Following the zeros, information such as the route number, date, the code of the meter reader who will read the route, and other data are recorded by the office operator using appropriate settings of the digit switches and operation of the read-in knob.

The meter reader will start at the first meter on his route, set the three top knobs to the correct digits for the customer number and the four lower knobs to the digits corresponding to the meter reading. Windows are provided in the case through which numbered targets show so that the meter reader can verify the digit knob settings. In addition, you will note that each side of the flat knobs is milled differently. This is to enable the meter reader to determine by feel and position which digit the knob is set to so that he will not have to visually verify each digit after he becomes practiced in the use of the recorder.

After setting all of the digit switches correctly the meter reader will press the button on the read-in knob. Pressing the button releases the lock and permits a built-in driving mechanism to drive the capstan and commutator a small amount in the forward direction. This feature with the ratchet on the knob prevents tape movement in a reverse direction which would cause erroneous recording. After the lock is released the meter reader rotates the knob one revolution at which point the lock takes over control and locks the mechanism again. During the period of this one revolution all of the digit switches have been sampled and the reading recorded on the tape, as shown in *Fig. 8*. This is a record of two complete revolutions in each of which three zeros and the digits 1 through 7 have been recorded along with the digits 4 and 8 which the interpreter unit converts to a dump signal for the computer. The clock track necessary for the Datatron 204 is also generated in the interpreter units (*Fig. 5*). Interpreter units for other systems have been designed. They are in general the same but vary in detail. As of now no universal computer language is available. All computers use a somewhat different logic. The interpreter unit is the black box which permits converting the recorder code to the computer language. Although in the present model binary coded decimal code is used, the switching ma-

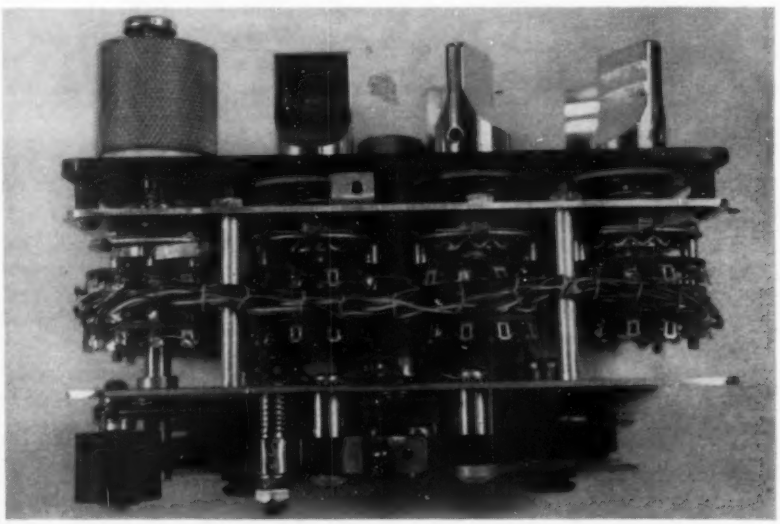


Fig. 6. Here is the recorder without its cover. At top left is the operate or read-in knob. The three digit switches for setting up customer number, and any computer instructions, etc., are on the top to the right of the read-in knob. Tape payout reel is at bottom right. Tape guides, pressure pad, and recording head are in bottom center, and the take-up reel is under the capstan drive (bottom left).

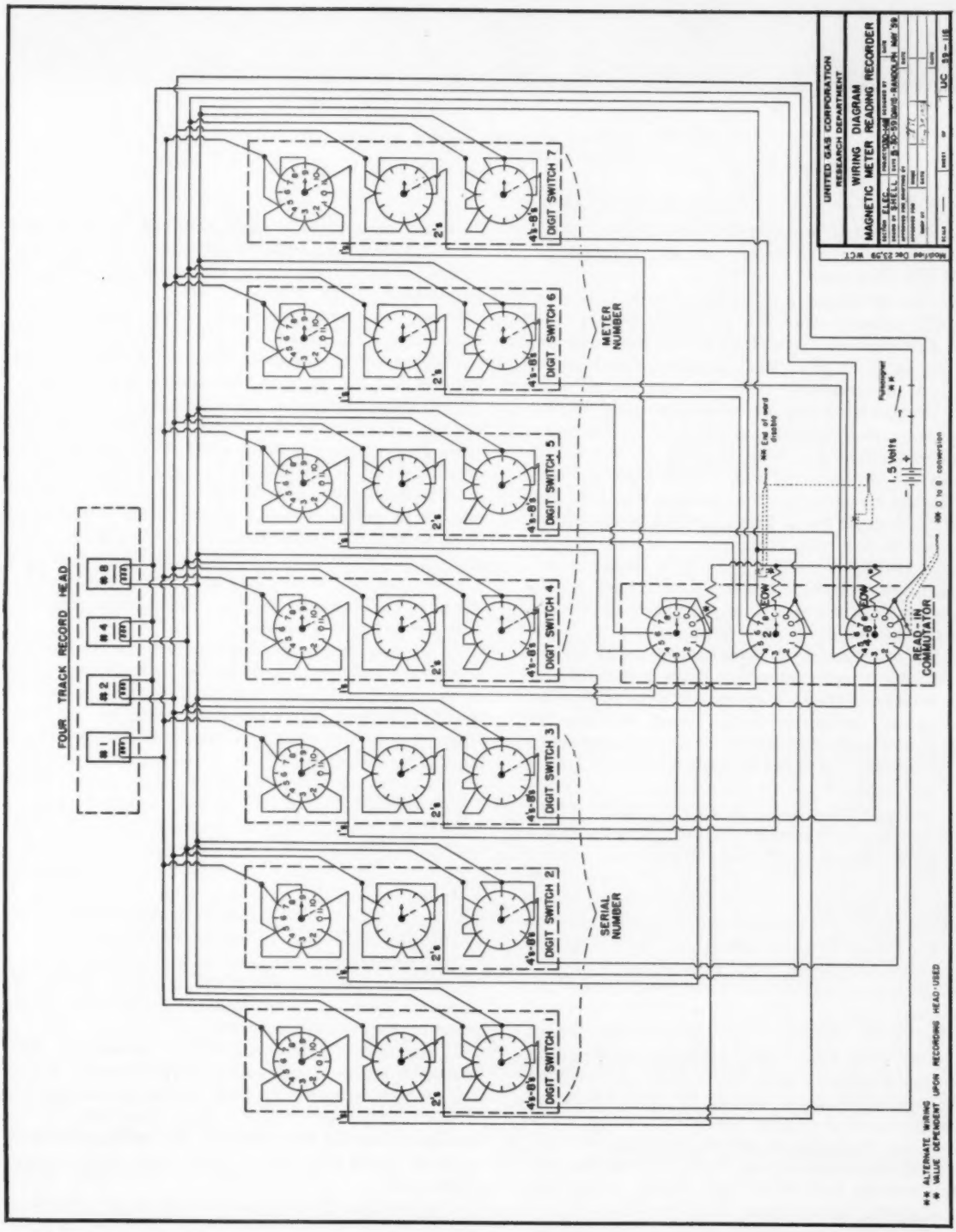


Fig. 7. Wiring diagram for magnetic meter reading recorder.

Fig. 8. Record of reading recorded on tape.

trix can be wired if necessary for other codes which may permit easier conversion into the language of some of the computers.

At the end of his route or his day's work, the meter reader will return to the office where an operator will remove the recorded tape reels from the recorder. There will be about 20 or 30 ft of tape for each route. These reels are removed with the tape wound in a reverse direction. Using an accessory table similar to that shown in *Fig. 4*, the operator will splice all of these tapes together and wind them on the larger reel shown in the top center of *Fig. 4*. The tapes are now wound in the forward direction and there may be 100 or so for each day's work. The large reel is now placed on the interpreter unit where the readings and instructions are either read directly into the computer for immediate computation using a previously stored program, or they are read into peripheral equipment for specialized handling. Interpreter units for some of the IBM and Remington Rand computers have been designed. The direct application of the meter reading system to any company's operation will, of course, depend on the accounting method used, the type of bills they will send out, and other factors concerned with the internal economics of their particular operation.

Since we cannot yet dispense with the meter reader the cost per meter for reading meters with any system will be about the same. The handling cost of getting the data into a computer ready for processing, we believe, can be reduced to the minimum consistent to the present state of the data processing art by the integration of this Magnetic Meter Reader's Recorder System with existing systems. We are convinced that reading accuracy over the old meter book method and several other systems also can be noticeably increased using the Meter Reader's Recorder. Prototypes of this system have been field tested. Suggestions by distribution system personnel have been incorporated into the mechanics of the system to provide features they require as far as this has been practical. The system is not limited to gas meters only but can readily be used in reading water or electric meters. In fact, this system lends itself very nicely to the concept of a central billing agency for all utilities.

The following data are listed for those who may be interested. In the recorder, d-c recording is used. The nominal current in each track in the head is 1.5 milliamperes and satisfactory recording can be accomplished down to 0.5 milliamperes. A minimum of 20 db signal noise ratio is easily obtained. If much over 1.5 milliamperes recording current is used cross print occurs in an unused track. Each meter reading requires about ¾ in. of tape.

It was considered paramount in this design to provide safeguards which would insure positive tape control to prevent erroneous movements and recording (see *Fig. 8*). Positive tape control is provided by: (1) Reverse tension on the payout reel which keeps the tape taut between the capstan and the payout reel (this is provided by a clutch and tension spring shown under the reel hub); and (2) a slight forward tension is provided by the differential torque of the spring belt which drives the take-up reel. This is shown in part between the pressure roller and the plate. Tape contact and position is maintained by tape guides and a pressure pad. Even with moderately severe handling of the recorder the tape has always remained taut and properly positioned.

To provide accurately dimensioned recorded pulses a separate device which we call a "pulsaligner" is incorporated in the recording circuits and operates in conjunction with the read-in commutator. As mentioned previously, when the operate button is pressed a built-in mechanism drives the commutator and capstan a slight amount in the forward direction. Chattering and false operation of the recording cycle at the start is thus prevented. The unidirectional ratcheted operating knob prevents erroneous tape motion after the initial start; total tape travel is limited by a locking pin guided by a lead-in groove in the knob which operates in conjunction with the operate button to lock the knob after a complete revolution.

The process of recording is independent of tape speed. The speed at which the playback on the interpreter operates is tailored to provide the proper input to the computer system.

In summary, a data acquisition system has been developed which is not only a break-through in fast and economical meter reading and bill processing but is also applicable to other tasks involving listing, tabulating or the like. The meter reading system is expected to be available in 1961 with other systems following.

A paper describing this development is tentatively scheduled for the SGA meeting in Galveston in April, and it will be mentioned in a paper to be presented at the AGA meeting in New Orleans in May. The recording system is scheduled for display at the AGA meeting in Atlantic City in October. ■

GAS Annual Gas Industry Construction Survey 1960

Company **226 Distribution, Transmission and Integrated Companies**

Name and title of person responding **Top Company Officials**

Company's total gas department appropriations budgeted for 1960 are $ **2,200,545,995.00** to be divided as follows:

DISTRIBUTION

12,044 Miles New & Replacement Mains	$ 325,541,993
8,124 Miles New & Replacement Service Lines	$ 136,719,135
Domestic Meters	$ 44,867,447
Service (house) Regulators	$ 8,583,823
Meters & Measurement Equipment (other than domestic)	$ 9,515,085
Pressure Regulation Equipment (other than domestic)	$ 7,972,429
Odorization	$ 931,332
Cathodic Protection	$ 3,060,483
Distribution Compressor Stations	$ 2,172,848
Scrubbing & Cleaning Equipment	$ 573,600
Communications Equipment	$ 683,585
Telemetering & Remote Control Equipment	$ 1,044,951
Miscellaneous	$ 4,771,110
Not Itemized	$ 106,072,679
Total Distribution	$ 652,510,500

PIPELINE (Mainline)

7,515 Miles of New & Replacement Pipeline	$ 433,186,697
Compressor Stations	$ 109,602,402
Measuring Stations	$ 5,008,189
Pressure Control Stations	$ 578,400
Dehydration & Scrubbing Equipment	$ 1,678,313
Communications Equipment:	
Mobile VHF	$ 380,000
Microwave	$ 1,363,724
Telemetering & Remote Control Equipment	$ 1,170,740
Cathodic Protection	$ 2,416,448
Miscellaneous	$ 4,285,015
Not Itemized	$ 672,344,397
Total Pipeline	$1,232,014,325

STORAGE-PEAK SHAVING

Natural Gas:	
Wells	$ 12,248,455
Wellhead Equipment	$ 2,623,383
Lines	$ 9,710,730
Compressor Stations	$ 9,025,297
Measuring & Regulating Equipment	$ 718,692
Dehydration & Scrubbing Equipment	$ 1,192,524
Automatic Control Equipment	$ 191,000
Liquefied Petroleum Gas:	
Tanks (bulk storage)	$ 3,461,645
Other LPG Plant Equipment	$ 5,383,250
Manufactured Gas Plant	$ 2,979,132
Miscellaneous	$ 6,802,551
Not Itemized	$ 46,357,900
Total Storage-Peak Shaving	$ 101,274,559

PRODUCTION (Natural Gas) & GATHERING

Exploration	$ 4,172,638
Drilling	$ 18,611,090
Wellhead Equipment	$ 4,020,871
Field & Gathering Lines	$ 27,924,540
Field Compressor Stations	$ 5,520,550
Field Measurement & Regulating Stations	$ 3,191,962
Field Treating & Scrubbing Equipment	$ 2,353,167
Miscellaneous	$ 23,364,800
Not Itemized	$ 39,618,905
Total Production & Gathering	$ 128,778,523

GENERAL (Distribution & Pipeline)

New Conventional Buildings	$ 23,991,013
New Prefab Buildings	$ 601,146
Office Systems & Equipment	$ 3,543,841
Shop & Lab Equipment	$ 1,099,147
Tools & Work Equipment	$ 4,425,682
Gas Quality Control Equipment	$ 502,900
Miscellaneous	$ 23,924,413
Not Itemized	$ 3,440,838
Total General Construction	$ 61,528,980

TRANSPORTATION & CONSTRUCTION EQUIPMENT

(Distribution & Pipeline)

Automobiles	$ 4,018,018
Service and/or Pick-up Trucks	$ 3,653,138
Medium and Heavy Duty Trucks	$ 3,723,945
Light Construction Equipment	$ 1,467,087
Heavy Construction Equipment	$ 1,729,564
Air Compressors	$ 1,051,403
Miscellaneous	$ 122,280
Not Itemized	$ 8,673,673
Total Transportation & Construction	$ 24,439,108

'60 Budgets reflect the American economy —in a gold-framed mirror

For the fourth straight year, the budgets reported in GAS Magazine's annual Gas Industry Construction Survey add up to more than $2 billion!

FOR the fourth straight year, the budgets reported in GAS Magazine's annual Gas Industry construction Survey have added up to more than $2 billion! The total—as this issue went to press—was $2.18 billion, not very far from the all-time high forecast last year. With late returns continuing to come in, a new record seemed to be merely a matter of the few more replies that seemed sure to come.

How does this compare with forecasts for the rest of American industry? The current consensus among economists is that 1960 will be a year of cross-trends. For many industries and companies, it'll be better than last year, or perhaps any other year. For some, it won't be quite as good. However, it should all average out to something quite close to 1959, either slightly over or slightly under. This is good, as the economy is now at a very high level.

Thus, the gas industry reflects this general economic picture. The 225 U. S. and Canadian distribution, transmission, and integrated companies replying to GAS Magazine's 1960 survey did produce a total slightly under last year's record forecast of $2.24 billion. However, in addition to the already-mentioned still-arriving late returns, it should be noted that several large Canadian companies did not furnish figures because they were awaiting approval on large projects. Actual construction in 1960, therefore, could exceed the survey total—even with all late returns included!

Still, one can't help but look for reasons for the leveling off—and one doesn't have to look far. The biggest single reason is that the industry is nearing a pause in its tremendous transmission-line-building cycle. Transmission projects, of course, are the big budget items that have boosted the industry's total budget to such records in recent years. As a representative of one of the nation's largest utilities put it:

"We—and a lot of other companies—have put in just about all the pipelines we need for the next couple of years. Now we're going to start hanging on meters, and that doesn't cost as much."

What happened to those great promises of the Golden Sixties? Nothing! Economists figure that the nation's current period of slow growth, which began in 1956, will continue until 1963 or 1964. Then, a fast growth period is expected and it should last out the decade. During that period, American industry is expected to grow 5 per cent (or more) per year. Currently, U. S. industry (including utilities) is growing at a rate of only 2 per cent per year.

Here's where current gas industry budgets—while reflecting the present economic picture—frame that picture in gold. It's true that the gas industry's spending in 1960 will be changed little from 1959. *But*, the industry is already growing so quickly—in relation to its assets—that a slight change really doesn't make much difference. While industrial USA is growing at a two-per-cent-per-year rate, the gas industry is expanding more than four-and-one-half-times faster. **The industry's average rate of expansion for this year and last is 9.1 per cent, or close to double the expected national average during the big boom forecast for the later '60's.**

Further gilding the frame is the fact that the gas industry's growth, itself, is growing from year to year, while its chief competitor's is decreasing. A highly respected independent economic consultant service forecasts that in 1960, gas will be the only utility industry to exceed its previous budget records. It estimates that the gas industry's 1960 expenditures will be 2 per cent *more* than last year's. This same service figures the electric utilities will spend 3 per cent *less* in 1960 than in 1959. Going from estimates to hard figures, this service finds that the gas industry spent 15 per cent *more* in 1959 than it did in 1958. In comparison, electric utilities were spending 6 per cent *less* than they had in 1958.

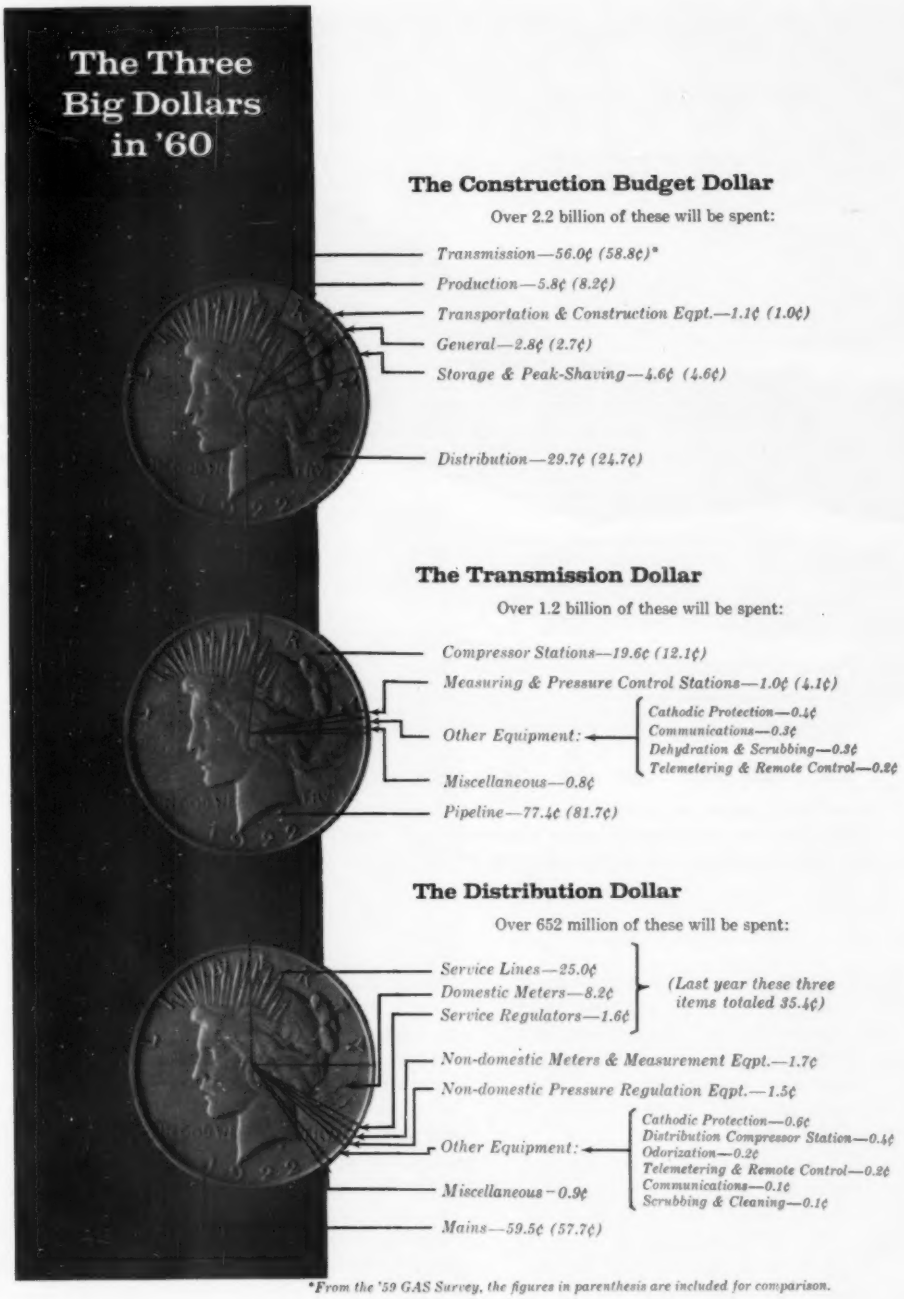
Where is the gas industry spending its money? The majority of the industry dollar, 56.2 per cent, continues to go for transmission facilities. This is a slight change from last year's 58.8 per cent. The main factor behind this change is the one already explained. The total transmission budget is still a whopping $1.23 billion.

The percentage of the gas industry dollar going into distribution systems is significantly up, from 24.7 per cent last year to 29.8 per cent in 1960. Distribution is not only taking a larger percentage of the gas budget dollar; it is also taking a lot more in dollars and cents. The actual increase is $95.3 million or 17.2 per cent. The main reasons behind this are the ever-increasing growth in population and gas' continuing and increasing popularity. And, of course, every one of the meters that is "hung up" requires service lines, regulators, appliances, service trucks, etc. So, every increase in meters is magnified when ultimately translated into dollars in the distribution budget.

Another significant major budget category change is in natural gas production and gathering, which now takes 5.4 per cent of the gas budget dollar as compared to last year's 8.2 per cent. The actual dollar figures are $117 million in 1960 and $172 million in 1959. More than anything else, this reflects changes in the oil market. A surplus of domestic crude oil, plus continued imports of low-priced crude, have had a general softening effect on the oil market. Therefore, expenditures for oil production, which goes hand-in-hand with gas production, have also softened. Another factor is the effect FPC utility-type regulations have of encouraging independent gas-producing companies to promote only intrastate sales.

The remaining two major budget categories stay relatively unchanged. Storage-peak shaving expenditures total $98.6 million, now account for 4.5 per cent of the gas budget dollar. General expenditures, including transportation and construction equipment, now total $84 million, up $1 million from last year. At $60.5 million, the general budget makes up 2.8 per cent of the total, while transportation and construction equipment, with $23.4 million, accounts for 1.1 per cent.

How many miles of pipe will be laid in 1960? Less than half the respondents furnished figures, but those who did say their companies will lay 7484 miles of transmission pipeline, 12,044 miles of mains and 8124 miles of service lines. Actual construction should be



*From the '59 GAS Survey, the figures in parenthesis are included for comparison.

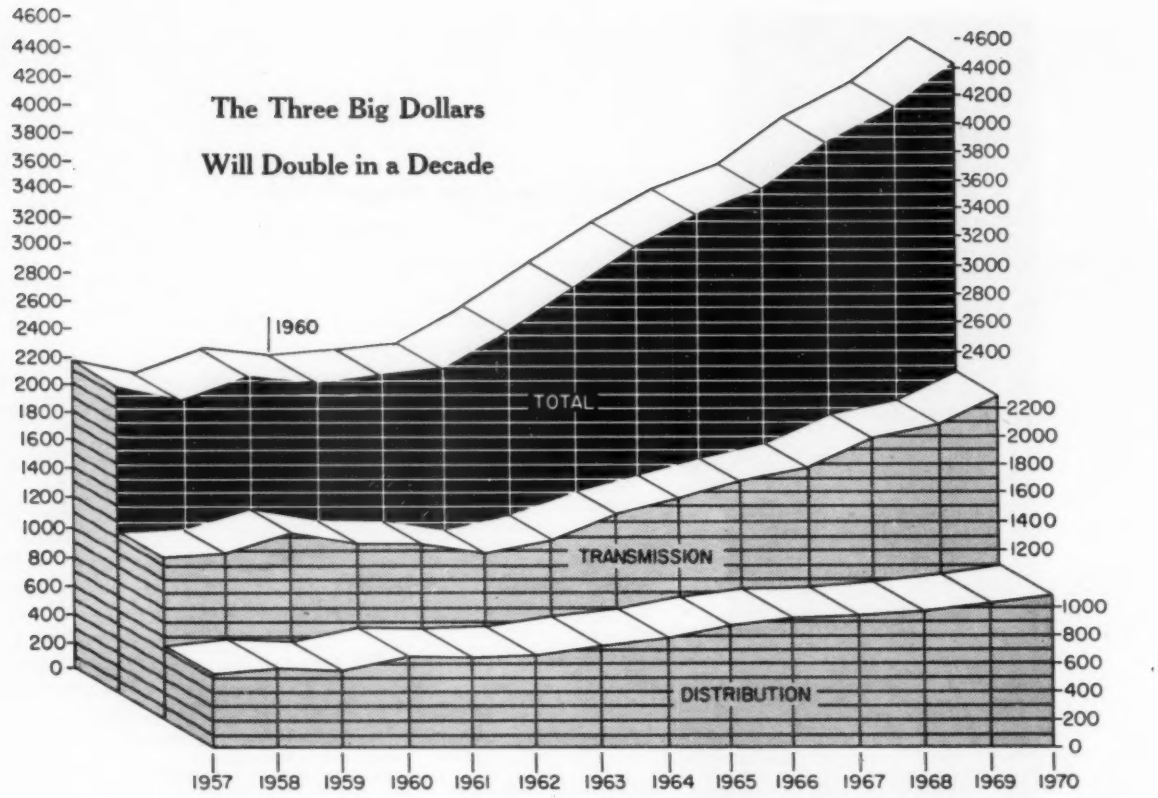
at least 35 per cent in excess of each of these figures.

Many of the individual items in this year's survey are not directly comparable to those in last year's, since the 1960 survey was itemized in much more detail. However, a number of significant comparisons can be made and all show sizable increases.

The executive who predicted a lot of meter-hanging immediately comes to mind, for most of these increases are in distribution. Biggest single dollar increase, for example, is for mains, which will require $38.3 million more this year than last, or a total of $325.5 million. Services, including meters ($44.8 million), lines ($136.7 million), and regulators ($8.5 million), are up an aggregate of $13.8 million.

This year's survey turned up a fantastic increase in two types of distribution equipment. The 1960 odorization equipment budget total is $931,000, a 770 per cent increase over last year. Three companies each plan to install more than last year's total $107,000. These companies plan $130,000, $208,000, and $370,000 odorization expenditures.

Not quite as spectacular but probably more indicative of an accelerating trend is a 462 per cent increase —to $574,000—in scrubbing and cleaning equipment. Last year's total, $102,000, will be exceeded by one company, which will spend $280,000. Another will



In millions of dollars, this graph begins with GAS Magazine's first $2 billion budget forecast (1957) and uses GAS Magazine survey estimates through 1960. Figures for the next 10 years are AGA forecasts revised by GAS editors to reflect combined U.S. and Canadian budgets.

come close with $100,000. This scrubbing and cleaning equipment growth should continue at a rapid pace, for the days of shopping around for a dry, sweet, and clean gas are over. Today's heavy demands for gas mean the pipeline companies often take what they can get—and distributors must pay more attention to cleaning and scrubbing equipment.

Another trend that continues is the way distribution companies continue to put more storage and peak-shaving money in LPG equipment and less in manufactured gas plants. The 1960 investment in LPG equipment should be up $3.28 million to $9.4 million. Meanwhile, manufactured gas investments will be cut in half to $2.9 million.

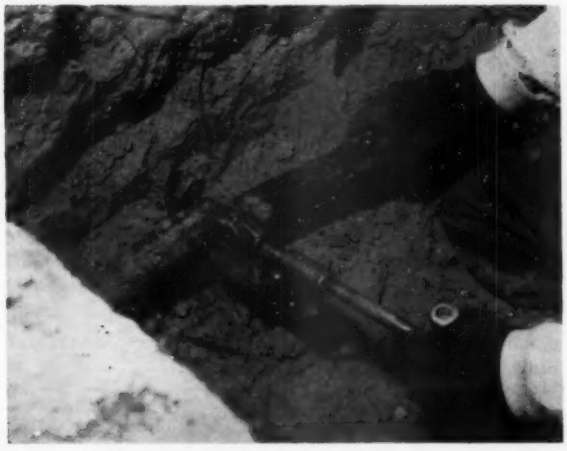
Of more temporary significance is a cross-trend in the transmission budget. While every other item is leveling off or showing a slight increase, compressor station expenditures are expected to jump 14.5 per cent, or $15.6 million, to $95.6 million. This is logical, since adding compressor horsepower is the way you supply those newly hung meters when you aren't building as much new pipeline. These transmission trends, however, should reverse themselves in a couple years, probably along about 1963.

And how do things look for those "Golden Sixties"? Revising AGA forecasts for the decade in light of GAS Magazine survey experience, next year should be much like this one. However, the pace should begin to pick up the following year, 1962. Look for new records in both total budget and distribution budgets, but neither will probably exceed the previous highs by very much. The pace should quicken in 1963 with the same two records again broken, but by substantial margins. By 1964, transmission budgets should also start breaking previous records. From there on out, it should be new records in all three categories each year, and each a substantial improvement over the last. As shown in the graph above, the total industry budget should exceed $3 billion in 1965 and $4 billion in 1969. Also in 1969, transmission budget should pass $2 billion and the distribution budget should pass $1 billion.

By 1970, the total annual gas industry budget should be more than twice its present size and the transmission budget alone should exceed the present total budget. The estimates for that first year in the '70's are: total budget, $4467 million; transmission, $2298 million; distribution, $1085 million. Is it any wonder industrial economists are already looking past the Golden Sixties to the "Soaring Seventies"? ■

A complete breakdown of the budgets of these 226 gas companies will soon be available. Write Dept. M, GAS Magazine, 198 S. Alvarado St., Los Angeles 57.

Excavation is made at junction of old steel service line and gas main. Petroleum gas torch warms plastics pipe enough so it can be molded to a tapered, closed point. Taper permits plastics pipe to slip through metal easier, and closed end keeps out foreign material during insertion. Leading end is pushed past far end of steel casing and cut off.



Section of old steel service line from cut shown to gas main at right (not visible) is removed as first step in replacement process.

Sharp metal edge left by pipe cutter is removed by hand reamer. Interior length of old pipe is then reamed before plastics pipe is inserted.

Plastics pipe relines save half

MORE than 230,000 ft of flexible plastics pipe has been used in Denver residential areas to reline corroded steel service lines for natural gas distribution. Another 425,000 ft has been used for new, direct-burial gas service lines. The Public Service Co. of Colorado has had no deterioration of the plastics pipe since it was first installed in 1951.

There have been cost savings and other advantages —particularly in the unique relining applications, first started by PSC in 1954.

Plastics pipe used by Public Service is 0.75-in. Tenite II, Formulation #435, flow M.H. butyrate transparent plastics tubing. It is extruded by Carlon Products Co. (Aurora, Ohio) and other plastics pipe extruding firms. The pipe is supplied in 250-ft lengths, coiled to 6-ft diameter. Individual services are seldom more than 100 ft, so joints in the lengths of plastics pipe aren't normally required.

Flexible piping is particularly well suited for replacement of existent steel service lines. The 0.75-in. plastics pipe, which has an OD of 1.055 in., is inserted through existing 1.25-in. steel pipe. This method is preferred by the company and used whenever conditions permit—about 85 per cent of gas service line replacement.

John F. Fugazzi, distribution maintenance engineer for PSC of Colorado, reports: "We have been able to reduce replacement costs by more than half and to more than double work volume production per crew. Prior to the use of the new method, we replaced an old service by the underground installation of a completely new steel service. Such service re-

placements required at least a crew day to complete. The decrease in service replacement crew time has been especially beneficial to us."

Improved customer relations also result from the plastics-reline method, which usually eliminates the need for digging on the customer's landscaped property.

Installation of plastics pipe inside an old service line and connection to metal mains and household piping are relatively simple. First, the old piping is exposed and disconnected at the gas main and building. Steel pipe is thoroughly reamed and blown to remove foreign matter and any sharp metal surfaces, welding icicles, etc. Normally, this requires no more than one small excavation at the wall of the customer's building. No property excavations are required where the old service line is an underground, front-wall entry installation and no meter relocation is involved.

After the steel pipe has been cleaned out, a continuous length of the plastics pipe is uncoiled and pushed through the steel pipe, then cut to the desired length. The plastics is then connected to a steel nipple outlet on the main with a steel insert sleeve and a metal compression coupling. Similar fittings are used to connect with metal piping at the building end if this union is made underground outside the building wall. Sometimes, however, the plastics pipe is threaded through the old service line to the inside face of the basement wall, in which case a special service-head adapter fitting is used.

This metal adapter fitting, which is 1.25-in. internal and 2.00-in. external threads at one end and a 0.75-in. compression outlet at the other, is turned on the old steel pipe at the point of service entrance in the building's basement. Plastics pipe used by Public Service Co. of Colorado is extended through the adapter to about 0.50-in. outside the fitting. A compression nut on the fitting is tightened against a steel stiffener sleeve which has been inserted in the plastics material. A 2.00-in. steel tee, plugged at one end, is then screwed to the adapter fitting. This plug completely encloses the open end of the plastics pipe and provides a metal fitting for the steel pipe extending to the meter location.

Steel insert sleeves are always used to support the flexible plastics pipe at compression points of compression fittings. Armor-tipped compression gaskets on all metal compression type fittings used by PSC of Colorado provide additional insurance against "pullout," although extensive shop and field tests—and experience to date—indicate this is not a problem.

The same size and type of plastics tubing has been used by the company for new natural gas service lines. Since March 1951, plastics pipe has been successfully used in uncased installations where highly corrosive soils are expected. These sites are selected to obtain the greatest potential benefits from the plastics pipe's corrosion resistance. Cost savings in new installations are not, of course, comparable to savings obtained when replacing old service lines. Coiled flexible plastics pipe is easier to handle than metal pipe and so goes in faster, but direct comparison with steel pipe installation has not been made.

The Public Service Co. of Colorado has made approximately 10,000 plastics pipe gas service installations so far, with no material failures. Service life is "impressive," according to the company, which plans continued use of plastics pipe for natural gas service. ■

LEFT: Worker assembles expanded type reamer and air motor to air hose. Tapered reamer on ground removes foreign material which prevents passage of expanding reamer. CENTER: Air-powered pipe reamer cleans out old steel service line before plastics pipe is inserted. RIGHT: Flexible plastics pipe is uncoiled and pushed through corroded steel service to house end, then cut to proper length.

Vancouver Island, Canadian pioneer with plastics pipe

By GEOFFREY MATTHEWS, Chief Distribution Engineer
Vancouver Island Gas Co. Ltd. Nanaimo, B. C.

VANCOUVER ISLAND GAS CO. LTD. pioneered the adoption of plastics pipe in Canada. Since November 1958, virtually all service connections from our steel distribution system have been made with plastics pipe. In September 1959 we finally secured approval from the Provincial Gas Inspection Department for the installation of plastics mains on a limited basis.

Early in 1958, after observing the progress being made in the United States with the use of plastic pipes by many gas distribution companies, management decided that our company should take a close look at this type of pipe. The first step was to satisfy ourselves as to the type of plastics, fittings, and installation procedure we would use. The second step was to secure approval from the Boiler Inspection Department under whose jurisdiction gas mains and services fell and later from the Gas Inspection Department to whom jurisdiction was transferred in the middle of our negotiations. Since British Columbia is an area of extremely tight regulation, this proved to be a lengthy, costly, and extremely frustrating experience.

We proceeded with our investigations, convinced that plastic had much to offer us particularly from an economy standpoint. We obtained information from 25 American companies currently using plastics in their systems as well as full technical data from the various manufacturers of plastics pipe.

After careful analysis we decided that styrene acrylonitrile resin rubber blend (Kralastic) would be most suitable for our operation.

The pipe is light, chemically resistant and retains high impact strength even at sub zero temperatures. Currently we are distributing 1200-Btu butane-air gas at a pressure of 18 psig. Minimum air temperatures experienced in this area can be as low as 0 deg F for limited periods. Minimum ground temperature at 18-in. depth is about 35 deg F. Our decision to use Kralastic was confirmed by laboratory tests by the B. C. Research Council which substantiated our findings. We had decided on the material we would use and based our standards on the American Gas Association report on plastics pipe standards DMC-56-16. The biggest problem was in selection of suitable fittings and procedures in the connection of plastics to steel because from all reports received the majority of failures had been due to the inability of obtaining a reliable connection between the two materials.

Various jointing procedures were investigated including flanged and screwed joints but the final choice was the use of a Dresser coupling (Style 90) with metal stiffener inserts in the plastic, to reinforce at the point of compression. No problems have been experienced with this method and the use of a compression coupling has the added advantage of compensating to some extent for any thermal expansion. Currently we are looking with favor on the "rolled-in" type of plastics-to-steel connection.

Plastics-to-plastics joints are made with solvent welded socket couplings. Two failures have been experienced with these couplings to date due to faulty molding and not in any way attributed to failure of material.

One humorous incident occurred at our first service installation. Mr. D. Denham, the provincial boiler inspector, who had been quite helpful during our approval struggles, wanted to observe our first installation. It was in November and the day turned out to be quite cold. Since it was unpleasant to stand around for long, our service crew rushed to complete the job. When they applied the test pressure you guessed it—a joint blew apart. We learned something about setting-up time of the cement in cold weather

We think one advantage of damage to plastics is that this damage is immediately apparent and considerably reduces the danger of an accumulation of gas going unnoticed for some time, as in the case of minor damage to steel services.

Two instances have occurred where our plastics lines have been damaged. Repair was simple and accomplished in a very short time simply by the use of a hacksaw, a short piece of plastics, couplings and cement.

One disadvantage of plastics is the fact that it cannot be detected with a pipe locator. However we have overcome this by the use of galvanized wire in the service trench. Additionally, accurate records are kept of all installations and pipe is supplied by the manufacturers in a vivid blue color to assist identification.

One of the provisions required by the boiler inspector was that a tag must be attached at the meter identifying plastics services. Initially, our service foreman decided that these could most easily be pro-

vided by using the machine at the ferry dock designed to allow tourists to stamp their name on a round aluminum token. About a dozen of these were used before it was discovered that in the center of the token was a horse shoe with the words "Good Luck." We decided the average customer might not be overly reassured by reading the tag on his meter, "Plastics Service—Good Luck."

Our prime reason in the first instance for investigation and use of plastics pipe was, of course, dollars. Service costs were high with a resultant higher cost to consumers for a connection charge. Since using plastics a more attractive connection policy can be offered adding one more string to our bow in the promotion of gas in the area. Actual savings have been approximately 28 per cent when comparing with ¾-in. wrapped steel pipe. Service crews, after very little training have become proficient in installing and definitely prefer to handle plastics rather than steel.

We are highly satisfied with our plastics installations and feel that full advantage should be taken of the lower friction factor of this material particularly when designing systems.

Our plans for this year include plastics mains and service installations which in many cases will enable gas to be supplied in areas where it would not be economically feasible to extend our steel systems. If natural gas in brought to the Island, it will enable us to extend gas distribution to many additional towns. We are hopeful that the Gas Inspection Department will allow us to use plastics exclusively up through 4-in. nominal pipe size ■

PLASTICS PIPE SPECIFICATIONS

GENERAL

Purpose:

This specification sets forth standards to which plastics pipe shall be installed in the Vancover Island Gas Co.'s distribution system.

Scope:

This standard covers rigid plastics pipe to be used for main and service connections and of a type suitable for natural gas as recommended by AGA Report DMC-56-16 and restricted to the area agreed with the Provincial Gas Inspection Department.

Wall Thicknesses:

Wall thicknesses for both main and services shall be not less than those recommended by AGA Report DMC-56-16 with tolerances plus or minus 5/1000 of an inch.

Minimum depth:

Plastics mains shall be buried to a minimum depth of 3.0 ft and services on private property shall be a minimum depth of 2 ft-6 in. wherever possible. Where not possible, the minimum depth on mains shall be 2.0 ft and minimum depth on services on private property, 18 in.

EXCAVATION AND PIPE HANDLING

Excavation:

Plastics pipe shall not be used for thrust boring or jacking. Trench for mains shall be a minimum of 12 in. wide and for services, 4 in. wide. The bottom of the trench shall be as smooth as practical and shall be free of rocks or abrasive material. In cases of extreme rocky soil, sand shall be used at least 10 in. above pipe.

Backfilling:

Care must be exercised when backfilling to ensure that no sharp object or rocks shall be in contact with the plastics pipe. Mechanical tamping shall not be used. Hand tamping shall be carried out on:

1. Pressure control tee—under the main and service pipe at this point so that full support is given before further backfill is carried out.
2. Compression coupling—under the coupling before any further backfill is carried out.

Backfilling shall, whenever possible, be carried out at the coolest part of the day (normally early morning).

In all other respects standard practices governing steel pipe shall be followed for excavation and backfilling.

Pipe handling:

Adequate support must be given when lowering pipe into trench and pipe must be lowered carefully to avoid striking any sharp objects. Pipe shall be "snaked" in the trench to permit contraction so that an extra foot is allowed for each 100 ft of trench excavated at 80 deg F. This may be reduced to 3 in. at 40 deg F and must be increased to 1 ft-6 in. at 100 deg F. Plugs shall be inserted in the ends of pipe before lowering, cemented caps or blind end Dressers shall be used when trench is waterlogged. *At no time* shall plastics pipe be left exposed in an open trench during the absence of service crews.

FITTINGS

Plastics-to-plastics connections:

Plastics-to-plastics connections shall be made using molded slip sleeve couplings and jointed with solvent recommended by the manufacturer or equal.

Service tappings:

Service tappings from plastics mains shall be carried out using the correct size of Mueller plastics pressure control tee. After removal of the service tee clamp, two hose clamps shall be installed to minimize any possible chance of movement of tee. Backfilling can be carried out with these in place after 30 minutes' duration.

Metal-to-plastics connections:

Metal-to-plastics connections shall be made using compression type couplings with metal inserts at least 5 in. long and couplings to be wrapped with Polyken tape. Hot asphalt or service cement will not be used. Under no circumstances shall plastics pipe be bent. Suitable fittings can and must be provided.

FIELD JOINTS

Layout:

1. Pipe shall be strung alongside of the ditch with coupled end of one length next to uncoupled end on another length. Care must be taken to ensure that pipe is not laid on any sharp objects.
2. Check each pipe length internally to ensure no foreign objects, water, etc. are left inside.

Jointing procedure:

1. After cleaning pipe end (wipe off all dust, dirt, and moisture), wipe inside of pipe coupling and area on pipe end with solvent-impregnated cloth before any cement is applied.
2. Apply cement evenly with a non-synthetic bristle brush. Ensure that there are no voids to both pipe

SPECIFICATIONS—Continued

and fitting. The lid *must* be left on the cement when not in use and gloves shall be worn when applying cement or solvent.

3. Insert pipe quickly into fitting as far as possible and with the pressure maintained, twist through 90 deg. Any excess cement which appears shall be wiped away. The length of pipe which has just been jointed shall not be turned.
4. The cement pipe shall be allowed to set for at least 30 minutes before it is moved. Extreme care must be taken to avoid any strain being placed on the cemented joint until it has time to set.

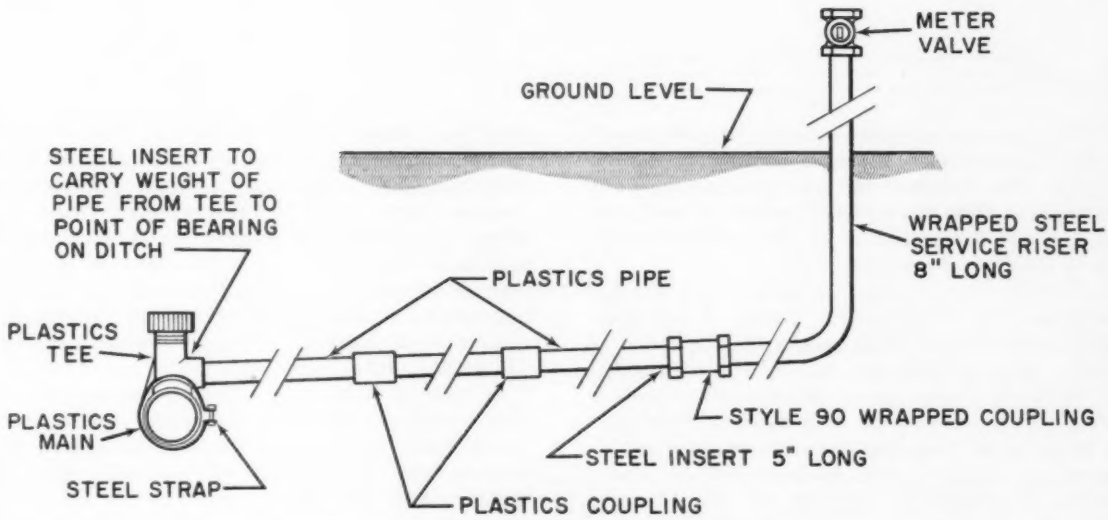
TESTING

1. All plastic mains and services shall be tested at 50 psi.
2. Mains shall be tested before being connected to existing main in accordance with ASA B31 standards.
3. Services shall be tested for at least 15 minutes duration. No registered pressure drop is permitted and test shall be carried out before the main is drilled out.
4. All connections possible shall be included in the test. Any connection not included must be tested with soap and water under gas pressure.

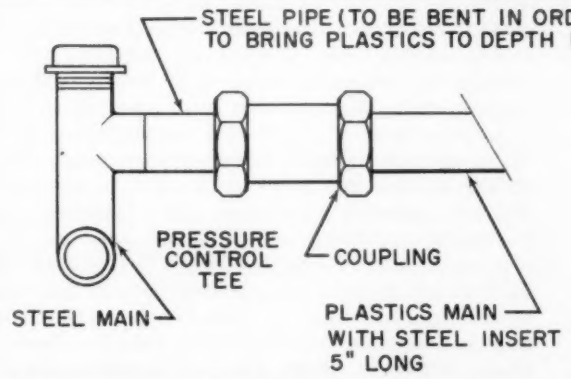
VALVE CONNECTIONS

Valves shall be installed using compression couplings with at least 3.0 ft of steel pipe between valve and plastics connection. Extreme care must be taken to insure that the weight of the valve is not carried by the pipe. Hand tamping shall be carried out around the valve, making sure that the earth is well consolidated so that no possible strain is transferred to the plastics in the event of valve operation.

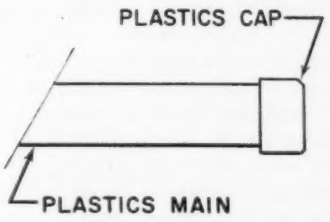
TYPICAL PLASTICS SERVICE CONNECTION FROM PLASTICS MAIN



STEEL TO PLASTICS (90°) TERMINATION PLASTICS MAIN


STEEL PIPE (TO BE BENT IN ORDER TO BRING PLASTICS TO DEPTH REQUIRED)
PRESSURE CONTROL TEE
COUPLING
STEEL MAIN
PLASTICS MAIN WITH STEEL INSERT 5" LONG

CONNECTION AT 90° TO STEEL MAIN
NO SHUT OFF REQUIRED



TERMINATION OF PLASTICS MAIN WHEN NO FURTHER EXTENSION IS POSSIBLE

Modern electronic flame safeguard control systems

TWO events helped open up large commercial heating, process and industrial markets to natural gas: (1) The network of gas transmission lines spreading out from the producing areas of the Southwest, and (2) the perfection of underground storage pools to store gas for winter peaks.

Such markets are not new. However, there is a lack of experience in the proper installation of gas equipment to large boilers and furnaces. This is most true in areas where natural gas is new, or where it has been in short supply. Even in areas long used to natural gas, it was not too long ago that conversion of a 50-hp boiler from coal to gas was termed a large installation. Now, we are firing boilers of almost power-plant proportions. Ratings of 300, 500, and 700 hp are not uncommon in public buildings, schools, and so forth.

Safety is, of course, the prime concern in such installations. Makers of large gas conversion burners and combustion control systems have made great strides in producing efficient equipment and flame safeguards. When properly applied, they "fail safe" in the event of pilot outage or failure of main burner ignition. Modern flame safeguard control systems have been available for some time. They are being constantly improved.

The problem seems to have three phases: (1) Proper use of component parts of the system; (2) adequate supervision of the installation, needed because of inexperienced workers; and (3) selling the customer on the value and need for adequate flame safeguard controls.

Gas utilities promoting and selling gas for large jobs cannot dodge the responsibility of doing everything possible to assure safe operation.

We at Equitable realized this. We set up minimum standards or requirements for large boiler and furnace jobs. These standards resulted from meetings with equipment and control manufacturers and insurance companies, study of AGA requirements and recommendations, and our own thinking. We are not going to spell out such basic needs as boiler or furnace room ventilation, air for combustion, or proper venting. These are generally understood. And they are covered in AGA Requirements and the American Society of Heating & Air Conditioning Engineers' Guide.

In making recommendations or requirements for safe operation, insurance companies and approval bodies must be considered. Groups whose standards must be met when working with units of 400,000 Btu per hour and over are:

1. American Gas Association: Its purpose is to develop national standards for gas equipment and requirements for its use. AGA standards and requirements are intended to insure safe operation, reasonable life, and good operating efficiency of appliances and accessories when properly installed.

With the exception of gas-fired boilers and unit heaters, AGA requirements have been mostly concerned with domestic appliances and requirements for listing of conversion burners with maximum inputs of 400,000 Btu per hour. It has not as yet set up listing requirements for electronic combustion safeguards.

2. Associated Factory Mutual (FM): The FM Laboratories is the testing arm of the FM fire insurance companies. They specialize in protecting large properties against fire, explosions, and other types of losses. FM standards for gas-fired equipment apply to boilers up to 50 hp and up and include provisions such as:

• A combustion safeguard with safety shutoff valve in both main and pilot supply. If flame fails, a com-

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Equitable Gas Co., Pittsburgh

GAS exclusive

plete shutdown shall occur in not less than 2 or more than 4 seconds.

• The gas pilot to be proved shall be located at a point where it will reliably ignite the main burner.

• Trial period for main burner ignition is limited to not more than 15 seconds with interrupted-type pilot. Intermittent-type pilot is not acceptable unless flame sensing means is transferred from pilot to main flame during running cycle. Constant-burning pilots with no means for 100 per cent cutoff are not approved.

3. Factory Insurance Association (FIA): This large group of stock insurance companies is primarily concerned with fire protection for its members and policyholders. FIA is similar to FM: It approves or does not approve each job on its individual merits. It differs from FM in that it has no specific written control requirements. It does not approve equipment as such, only its application.

4. Underwriters Laboratory Inc. (UL): This nonprofit organization is sponsored by the National Board of Fire Underwriters. Its lab tests devices, systems and materials in their relation to life, fire casualty hazards, and crime prevention. UL tests, inspects, and approves equipment or systems according to its established standards of safety. Its field inspectors do not police installed equipment. They do, however, make periodic inspections of products coming off manufacturers' lines to be sure that equipment is being produced to the same specifications as originally tested.

Checks of installed equipment are made by local electrical inspection groups, who are provided with complete listings of UL-approved devices.

In this article we refer to several types of pilot operation. They may be defined as follows:

Intermittent ignition: Spark-ignited pilot. Pilot

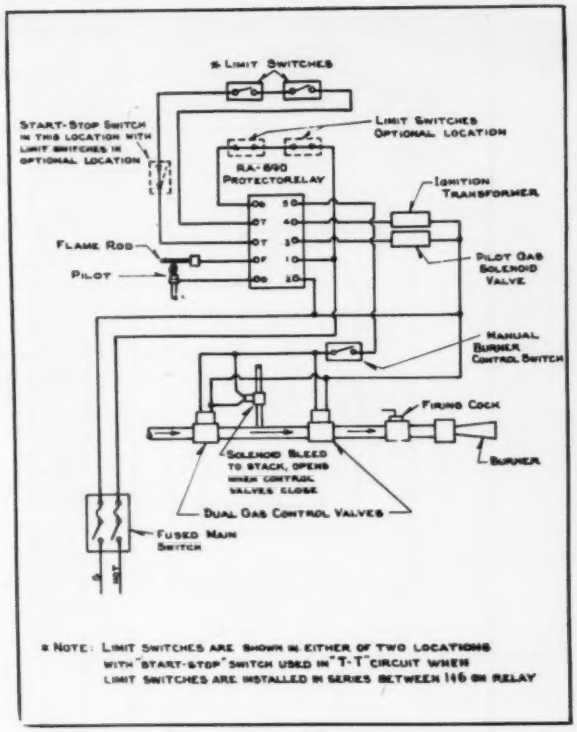
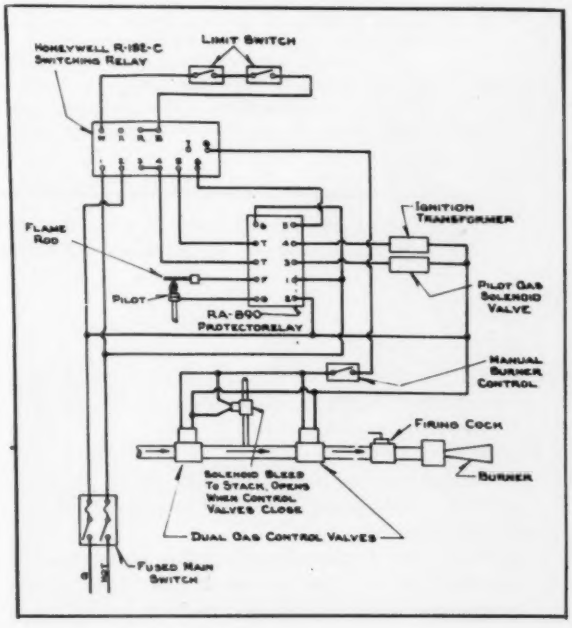

2 Limit Switches
Start-Stop Switch in this location with limit switches in optional location
Limit Switches Optional Location
RA-890 Protectorelay
Ignition Transformer
Flame Rod
Pilot
Pilot Gas Solenoid Valve
Manual Burner Control Switch
Firing Cock
Burner
Solenoid Bleed to Stack, opens when control valves close
Dual Gas Control Valves
Fused Main Switch
2 Note: Limit switches are shown in either of two locations with "start-stop" switch used in "T-T" circuit when limit switches are installed in series between 146 on relay

Fig. 1. Basic control wiring diagram with intermittent pilot providing component check of the relay using flame-rod type electronic pilot flame safeguard.

Fig. 2. Basic control wiring diagram using constant burning pilot with interrupted feature providing component check of the relay on each "on-off" operation of the burner—flame-rod type electronic pilot flame safeguard.



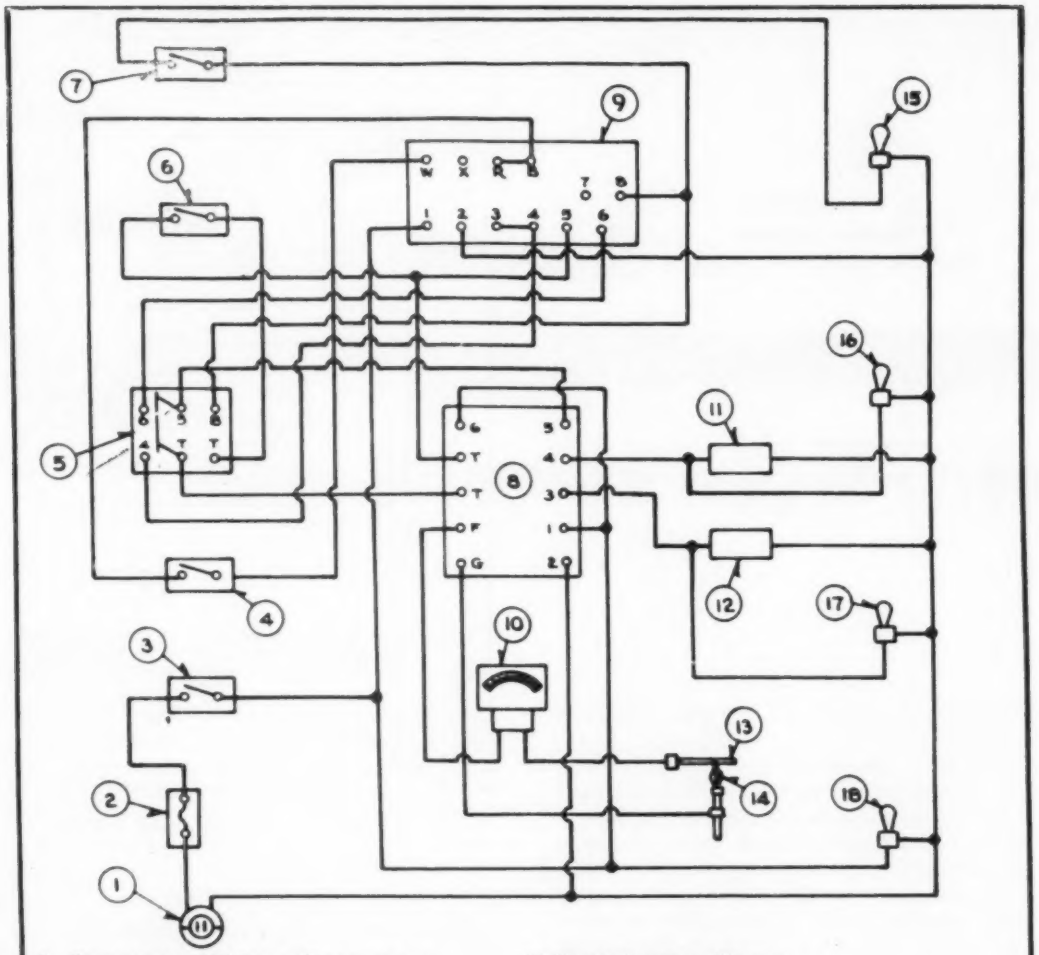

1 RECESSED 110 V MALE RECEPTACLE
2 FUSE
3 110 V. MAIN SWITCH
4 LIMIT CONTROLS FOR CONSTANT PILOT CIRCUIT
5 D.P.D.T SWITCH FOR TRANSFERRING CIRCUITS
6 LIMIT CONTROLS FOR INTERMITTENT PILOT CIRCUIT
7 S.P.S.T. MANUAL BURNER CONTROL SWITCH
8 HONEYWELL R.A. 890 PROTECTORELAY
9 HONEYWELL R 182 C SWITCHING RELAY
10 MICRO-AMPERE METER
11 IGNITION TRANSFORMER FOR PILOT SPARK IGNITION
12 PILOT GAS SOLENOID VALVE
13 PROTECTORELAY FLAME ROD
14 PILOT
15 LAMP INDICATING MAIN GAS CONTROL VALVE
16 LAMP INDICATING SPARK
17 LAMP INDICATING PILOT GAS VALVE
18 LAMP INDICATING MAIN SWITCH POSITION

Fig. 3. Demonstration control panel wiring diagram with switch to transfer to either intermittent pilot or constant pilot with interrupted feature, each with component check. Flame-rod type electronic pilot flame safeguard.

on for the duration of the burner on cycle. This insures that a means of igniting the incoming fuel will always be present.

Interrupted ignition: Ignition of pilot which is cut off as soon as the flame is proven or at the end of a pre-determined time. Requires main flame supervision.

Constant pilot: A pilot flame burning at all times whether or not the burner is on. Local requirements may call for this to be a constantly proven pilot. This provides a means of burning fuel which may leak into the combustion chamber during off cycles. Used to prevent possible hazardous conditions on burner start up.

Two flame safeguard control systems are diagrammed and described in *Figs. 1 and 2.* They unite the requirements of the approval bodies and some features resulting from our own thinking about safe applications. Each of these systems will meet the approval of one or more of these bodies.

• **Figure 1**

This is a simple electronic basic control wiring diagram. It has intermittent pilot operation with component checking of the relay, using a flame rod type electronic pilot protection.

With this circuit or system, the Protectorelay is powered from the available line voltage on terminals 1-6-& 2. The system is started either through a start-stop switch and/or thermostat, or limit switches. For example, with the start-stop switch and limit switches in the closed position, circuits 3 & 4 on the Protectorelay energizes the pilot solenoid valve and the ignition transformer, respectively. This provides the electric spark for pilot gas ignition. Ignition must take place within the time limit specified on the Protectorelay (generally 20-40 seconds). If pilot ignition does not occur within this time limit, the warp switch within the Protectorelay breaks the electric circuit, de-energizing Nos. 3 & 4 circuits, resulting in a "fail safe" condition.

If pilot flame is established within the specified time, and the pilot flame is of sufficient size and properly located in relation to the flame rod, No. 4 circuit to the ignition transformer drops out and No. 5 circuit becomes energized. This in turn opens the gas control valves in the gas line to the burner.

Two gas control valves are shown in the line to the burner, with a solenoid controlled bleed line to the stack or outside atmosphere. This is a reverse acting solenoid valve—reverse in relation to the gas control valve operation. When the gas control valves are open, the solenoid valve is closed, and vice versa. The purpose of the duo-gas control valves and solenoid "bleed off" is to prevent any leakage of gas through the first control valve (when in the closed position) from entering the boiler or furnace. This arrangement is practically a must when intermittent or interrupted pilots are used. In our opinion this is preferred over a pre-purge and post-purge setup: It is better to prevent gas from entering the boiler or furnace during the "off" cycle than to try to remove it after it is in the boiler.

It is obvious that the pilot must be properly positioned relative to burner or main flame to insure positive ignition of the main burner.

When a job is installed, a pilot turndown test should be made regardless of whether the installation uses the flame-rod, photo-cell, lead sulfide cell, or the U. V. cell as a means of flame sensing. It is a safety feature that should be made mandatory for the customer's own protection. The point of this test is to be certain that the igniting pilot flame may be sensed by the protecting device but still not be of sufficient size or in the proper location to ignite the main burner.

• **Figure 2**

Fig. 2 is similar to *Fig. 1*, except that an R-182-C switching relay has been added in the circuit between No. 5 terminal on the Protectorelay and the control valves.

This relay provides for a constant burning pilot

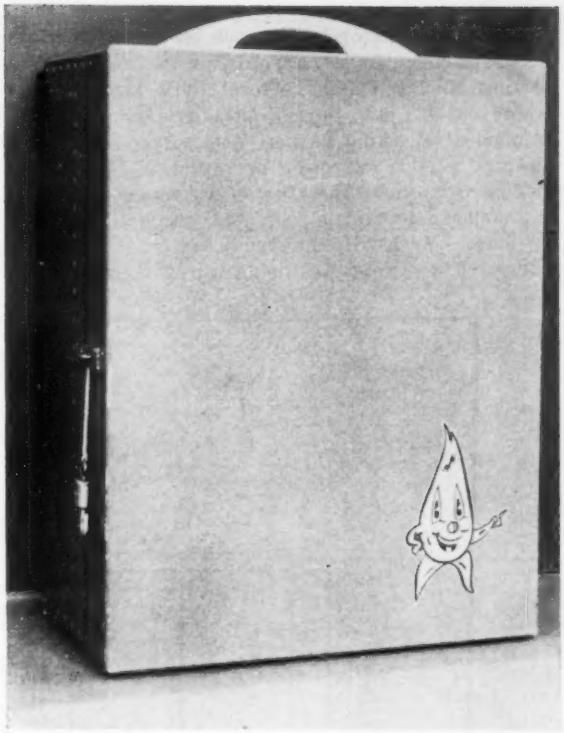
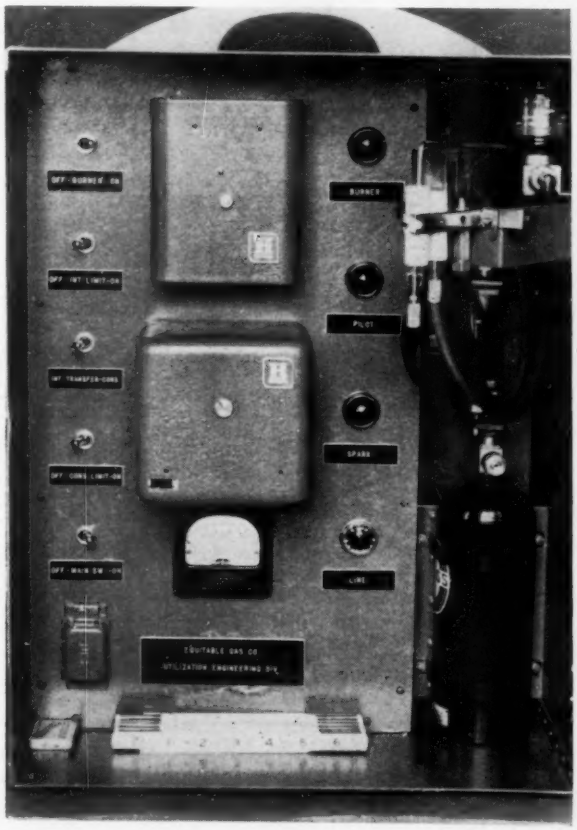
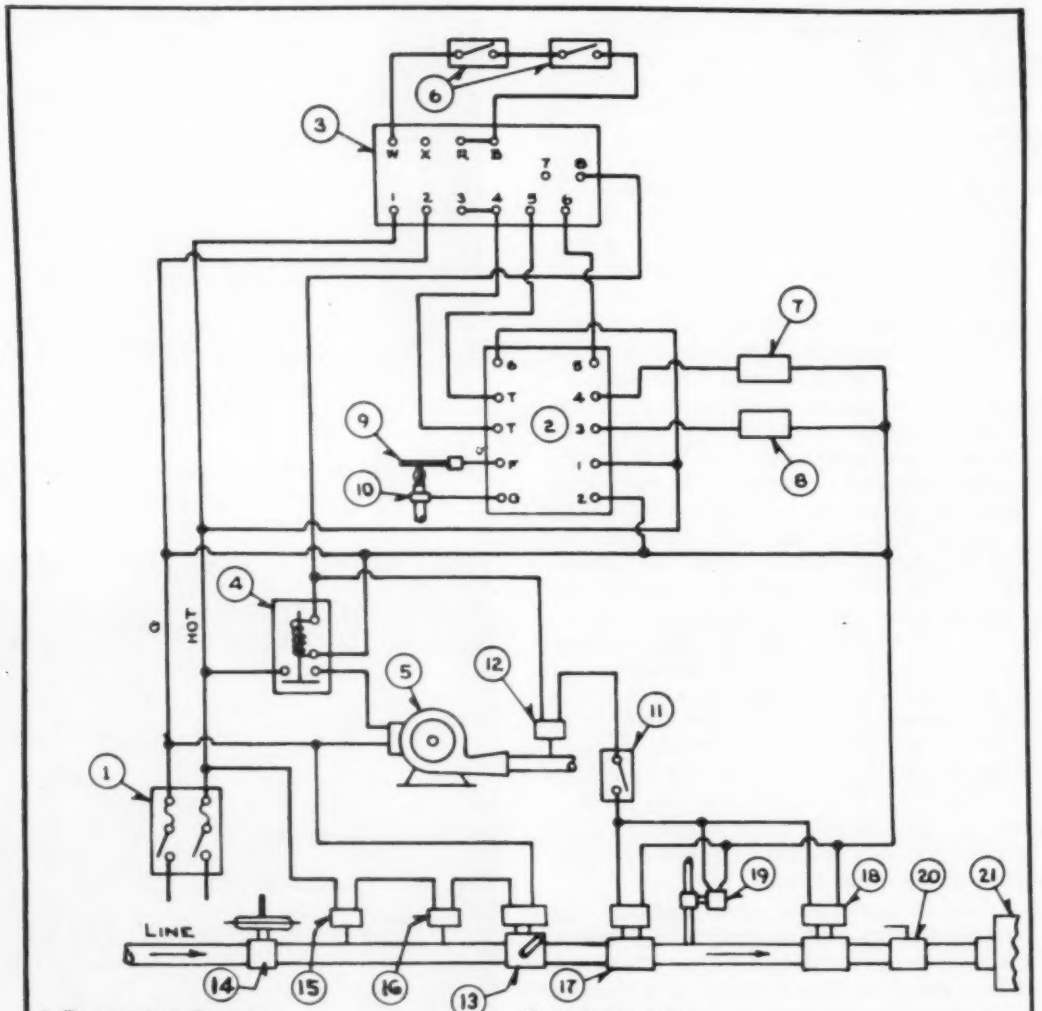


Fig. 4 (above). Portable demonstration panel, weighing about 40 lb. Fig. 5 (below). Interior of demonstrator.



with interrupted feature to permit component checking of the Protectorelay on each on-and-off operation of the burner. In other words, on each opening and closing of any one of several limit switches, low-water cut-off, etc., burner outage is simulated and component checking of the Protectorelay is achieved through a pilot relighting operation.

This component checking is accomplished through a double-throw relay, actuated through the limit switches. With all limit switches on the "in" or energized position, the double-throw relay contacts also are on the "in" position, energizing terminal 8-6. In turn, this energizes the gas control valves, allowing gas to flow to the burner. With limit switches in the "out" or de-energized position, the switching relay moves to the second set of contacts. All circuits are the same as on the "in" position except that 6-8 is opened, de-energizing, and closing the control valves, which shuts off the flow of gas to the burner. While switching from one set of contacts to the other, the T-T circuit on the Protectorelay is momentarily interrupted, simulating a burner-off condition. Re-



1 Fused Main Switch
2 Honeywell RA 890 Protectorelay
3 Honeywell R 182 C Switching Relay
4 S.P.S.T. Motor Relay
5 Blower For Combustion Air
6 Limit Switches
7 Ignition Transformer
8 Pilot Gas Solenoid Valve
9 Flame Rod
10 Pilot
11 Manual Burner Control Switch
12 Air Switch
13 Safety Gas Shut-off Valve. Manual Reset
14 Gas Pressure Regulator
15 High Gas Pressure Switch
16 Low Gas Pressure Switch
17 Gas Control Valve
18 Gas Control Valve
19 Solenoid Gas Bleed Valve. Opens When Control Valves Close
20 Manual Gas Firing Cock
21 Burner

Fig. 6. Basic control wiring diagram showing adaptation of various controls to circuit using constant burning pilot with interrupted feature providing component check of relay on each "on-off" operation of the burner—flame-rod type electronic pilot flame safeguard.

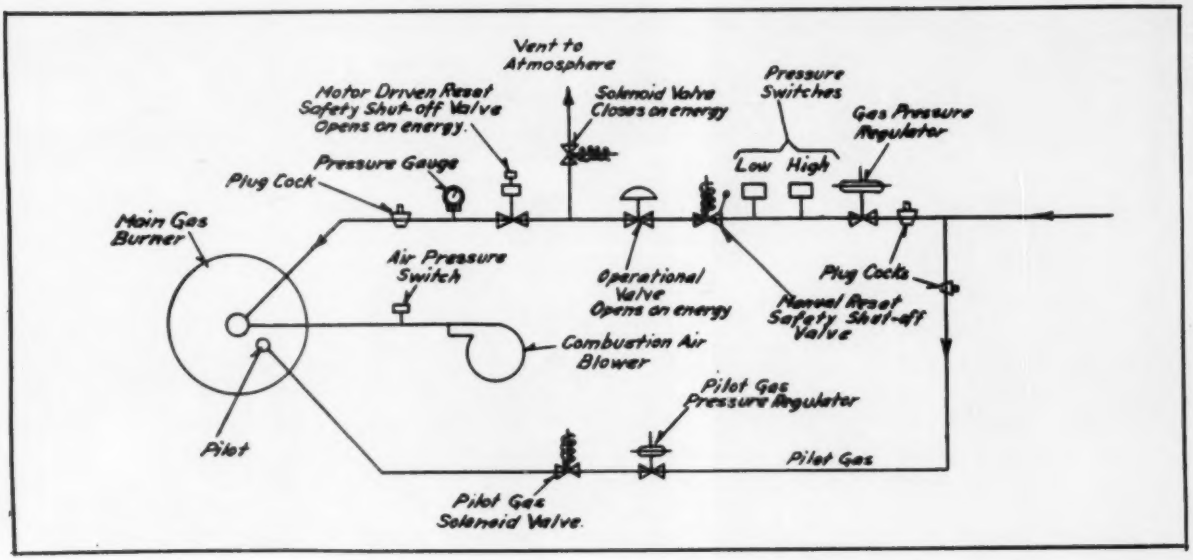


Fig. 7. Gas valves for safety system on single burner for boilers.

ignition is then established through 3 and 4 on the Protectorelay. This operation takes about 2 seconds and provides a component checking of the Protectrelay. If any part of the electronic circuit fails, or if the pilot flame fails to reestablish within the specified time limit, operating valves will remain closed, resulting in a "fail safe" operation.

The dual gas control valves are also shown in this circuit as being desirable. However, with a properly sized and located pilot to ignite any gas which may leak past the supposedly tight control valve, dual valves are not absolutely necessary with a constant-burning pilot with an interrupted feature.

This circuit is recommended where atmospheric type pilots are used.

• Portable demonstration control panel

There is still a problem. It remains even after recognizing the need for flame safeguard control systems on large jobs and devising control circuits as shown in *Figs 1 and 2*. The program must be put across to the building owner, mechanical contractor, consulting and operating engineers, and others. Written specs and wiring diagrams are hard for the layman to follow. Some means of on-the-job demonstration is highly desirable to show the almost instant response of the controls and the "fail safe" features.

To meet this need, we designed, assembled and built a portable demonstration control panel. Its size and weight make it easy to transport.

The flame safeguard described here was chosen for use in the demonstration panel. Either intermittent pilot operation or constant burning pilot with interruption feature providing component check was acceptable. Therefore, the circuits in *Figs. 1* and *2* were combined (*Fig. 3*), with a selector switch to transfer the operation from one circuit to the other. Also, a microammeter was added in the flame rod circuit. This provides a means of showing the condition of the pilot flame and its contact with the flame rod.

This diagram was used in the demonstration panel (*Figs. 4 and 5*). The case is 16 in. across the front, 21½ in. high, and 9 in. deep. Total weight is about 40 lb. A small bottle of L.P. gas was installed in the cabinet. Thus, we can show these two circuits wherever 110-v a.c. is available.

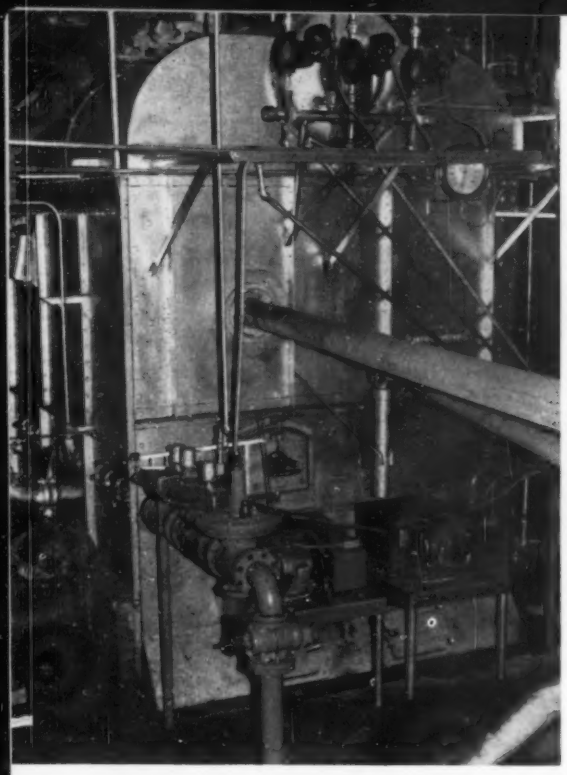
The panel serves two functions. Not only does it show the electronic flame safeguard control systems to our customers on their premises. It also has value for training or instruction purposes, checking electronic tubes and their operation by simulating faults as found in the field.

Fig. 6 shows the application of various valves and controls to the control circuit. This is not a rigid setup. It is merely a composite application of automatic controls such as limit switches, valves, etc., to the flame safeguard circuit. More or less controls can be used, depending on the type of operation desired. An understanding of this basic relay provides a foundation for insight into the more complicated circuits built into programming type relays.

Fig. 7 shows diagrammatically the various controls, valves, etc., involved. Definitions of the valves and switches shown are as follows:

Manual reset safety shutoff valve: An electrically operated valve designed to automatically shut off fuel flow when de-energized. It shall be constructed so that it cannot be restricted or blocked in an open position. A valve of this type shall be opened and reset only by pushbutton-operated motor drive or by manual means after being energized. Such a valve shall close upon being de-energized regardless of the position of any reset handle.

Operational valve: A valve which adjusts fuel flow to the burner for high-fire, low-fire and modulating fire conditions.



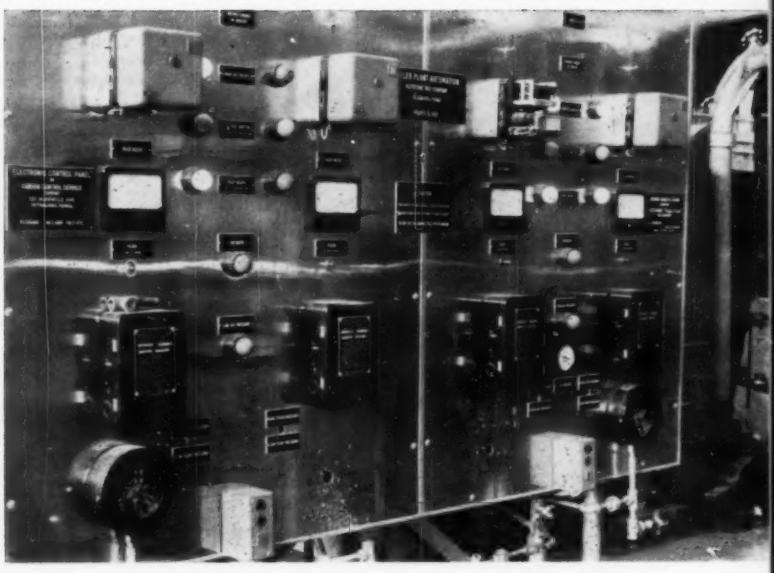


Fig. 8 (left). Conversion burner installation in one of two 250-hp boilers.

Fig. 9 (above). Custom-built stainless steel control panel.

Motor-driven reset safety shutoff valve: An electrically operated valve designed to automatically shut off fuel flow upon being de-energized. It shall be constructed so that it cannot be restricted or blocked in an open position. Valve is opened and reset automatically by integral motor device only, following the proving of the pilot burner flame.

Air pressure switch: A device installed in the air stream which senses air flow or less thereof and electrically transmits the resulting impulses to the flame failure circuit.

High pressure switch: A device to monitor gas pressure and arranged to shut down the burner at a preset high pressure.

Low pressure switch: A device to monitor gas pressure and arranged to shut down the burner at a preset low pressure limit.

This arrangement is nearly the same as suggested by Factory Insurance Association. However, a manually reset safety shutoff valve is shown in the gas line, up-stream of the operational valve. This valve used with "high" and "low" gas pressure switches will close on improper pressure. Its use is particularly essential where low gas pressure equipment is supplied from high gas pressure lines. It protects against both erratic functioning or complete failure of the gas pressure regulator. The valve also will close on electric failure. And it can be used in conjunction with a remote or panic switch to cut off gas supply to the burner in an emergency.

A gas pressure gauge is also indicated between the motor-driven re-set safety shutoff valve and the plug or firing cock. This gauge provides for periodic check of the seating of the valves as well as showing the gas pressure at which the burner is operating.

Some companies advise main burner flame supervision as well as pilot flame supervision. They do this by interrupting the pilot flame in order to have the sensing element prove main flame in a prescribed length of time after pilot ignition has been proven. One of the approval bodies specifies 15 seconds for proving main flame. Main flame supervision can be done by flame rods, photo-cells, or the more recent UV cell. The latter is used with the programming type relay.

Obviously, in proving main flame, the sensing element must be located in, or focused on, the intersection of pilot and main flame. Main flame supervision also may be done by installing a normally closed switch in series between the pilot solenoid terminal on the relay and the pilot solenoid gas valve. This switch is operated through a timing device connected in parallel with the main gas control valve circuit. After the prescribed time delay from the sensing of pilot flame, this timer will open the pilot switch, cutting off the gas to the pilot. If there is no main flame present the system will "fail safe" by closing the main gas valve. The timer automatically resets itself on the burner "off" period. While main flame supervision is not indicated in any of the drawings, this added safety measure is desirable.

As already stated, however, every control system should meet the requirements of the approval bodies concerned.

We are not suggesting a fixed or definite electronic flame safeguard control system for all gas-fired boilers or furnaces. Rather, we are offering a simplified explanation of two basic types of electronic flame

safeguard systems. The "intermittent pilot type" (*Fig. 1*), and the "constant burning pilot" with interrupted feature (*Fig. 2*)—each providing for the "component checking of the electronic circuit" on each "on" and "off" operation of the burner. Both basic types are shown combined in one portable demonstration panel with choice to show either one through a double throw selector or transfer switch (*Fig. 3*). Adaptations of various controls to these circuits are shown in *Fig. 6*. What we have considered essential controls are presented in *Fig. 7*. It should also be noted that in each diagram we show a manual burner control switch. Experience has proven this switch to be invaluable when checking pilot systems.

By no means should these flame control systems be considered as the last word. We have tried to stress that they are basic and have considerable value for demonstration and training purposes. Improvements and refinements for added safety measures in large gas burner operation are being made constantly. We now have some installations on our lines with electronic flame supervision by a comparatively recent spectral radiation type which to date has proved very satisfactory. This type of flame safeguard has decided advantages over the flame rod type, particularly for supervising both pilot and main burner flame.

Choosing the electronic flame safeguard protection and the needed complement of valves and switches on each individual jobs must be based on: (1) type of pilot; (2) type of burner; (3) program of operation; (4) location of boiler or furnace—for church, school, hospital, large commercial establishment or industrial plant; (5) approval of the insurance body; and (6) compliance with local codes.

To show these considerations and the latitude of selection of controls, we photographed two widely different gas boiler installations. One is a converted boiler in an industrial plant. The other is a gas-designed commercial installation. Each has electronic flame safety controls designed to meet the respective requirements.

Fig. 8 is a gas conversion burner installation in one of two 250-hp boilers at the Keystone Box Co. in Pittsburgh. These boilers formerly were fired with pulverized coal fed into the boiler through the pipe shown entering the front. The custom built stainless steel control panel is shown in *Fig. 9*.

Package type gas-fired steam generators are shown in *Fig. 10*. These boilers are rated at 250 hp and are located on the roof of the Carlton House hotel in Pittsburgh. They furnish steam for heating, water heating, and process steam for the kitchen. The control panel box is at the right front of the boiler. It is factory built and wired. *Fig. 11* shows the control box.

Regardless of the type of electronic flame protective device employed, its basic operation should be thoroughly understood. Also, how the auxiliary controls needed for safe operation may be used in the control circuit. We find local manufacturers' electronic specialists very cooperative. Their aid is invaluable both in the adaptation of safety controls to special jobs and in trouble shooting baffling cases. ■

ACKNOWLEDGMENT

The author wishes to thank William Schossow and Carl Swanson of Minneapolis-Honeywell Regulator Co. for their help in preparing the article. Also, Bailey Settle of the Carlton House and I. Verbofsky of Keystone Box Co. for permission to take photos of their installations.

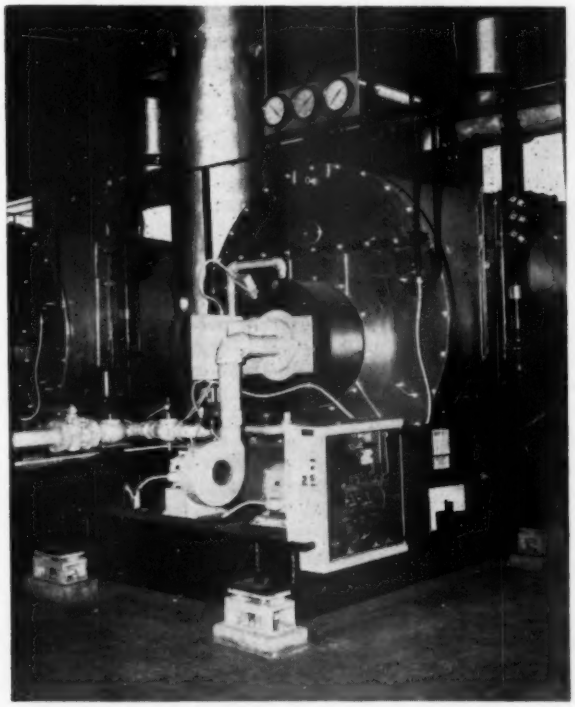
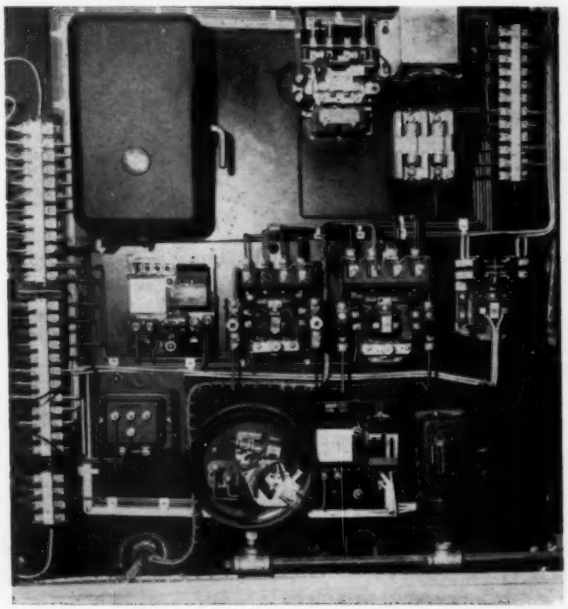


Fig. 10 (left). Packaged type gas-fired steam generator, with control box at right front of the boiler. Fig. 11 (below). Close-up of control box.



GAS DISTRIBUTION NEWS

New England gas utilities form emergency pool

SEVERAL not-serious line breaks in Tennessee Gas Transmission and Texas Eastern Transmission systems led New England Gas utility customers of TGT and Algonquin Gas Transmission (fed by TETCO) to band together to study action that might be taken in the event of a serious disruption of pipeline natural gas deliveries.

A steering committee was formed. It included the presidents or top operating executives of customer companies representing 72 per cent of TGT's and 70 per cent of Algonquin-Texas Eastern's New England sales, respectively. R. J. Rutherford, president of Worcester Gas Light Co., was selected and served as chairman.

As agreed in an informal meeting at Rockland, Maine, on June 18, 1958, the steering committee was organized to explore possibilities of mutual assistance on common problems in New England.

The various complex problems were resolved as falling into four principal areas of study. In their order of importance these areas, along some explanation, are as follows:

Area I—Concerns itself with the combined and cooperative use of existing pipeline and distribution company facilities to produce the most benefit to the customers, companies, and pipelines with maximum continuity, economy, and efficiency of service

Area II — Concerns itself with cooperatively insuring that any excess capacity of any kind of the pipelines will be used to the fullest extent possible to the mutual benefit of the distribution companies and the pipelines.

Area III—Concerns itself with the feasibility and economics of New England storage facilities for emergency and peak shaving requirements.

Area IV—Concerns itself with long range planning as to the possibility of one or more cooperative manufacturing facility for emergency standby, peak shaving, or supplementary supply of an interchangeable gas.

Rochester's new Heating and Wiring Information Center, located next door to the main office building, was opened recently.

Rochester Gas opens information center

Rochester (N.Y.) Gas & Electric Corp.'s new "Heating and Wiring Information Center" is open for business.

The center, located next door to the company's main office building, is, as the name suggests, for information. Heating equipment or other devices are not sold. The object of the center is to dispense advice, information, and help in solving heating or wiring problems.

At present, nine different brands of quality gas furnaces are on display. Periodically, these units will be replaced in an orderly program designed to show all quality lines being sold locally.

At each unit are literature racks with folders describing all sizes and types of equipment available in the manufacturer's line.

Maryland's rate base challenged

A BILL limiting the rate base for all utilities to plant and equipment in actual use and supplying some service to customers is before Maryland's legislature.

The bill was introduced by Delegate F. X. Gallagher, who said utilities are now including plant and equipment to be in use in the foreseeable future in setting rate base. Maryland utilities are permitted a 6.25 per cent return on their base.

Existing Maryland law says rate of return is based on a "company's property, used and useful in rendering service to the public." Gallagher wants to add the word "actually" so the phrase would read "property actually used and useful. . . ."

He said there is no reason why consumers should pay for something which is not even in existence. He cited a case in which Baltimore Gas & Electric added $32 million to its rate base for plant and equipment it was about to build and acquire.

FLAP IN FLORIDA

SIX months after it introduced natural gas service in Miami, Fla., The Houston Corp. was ordered by that city's commission to halt expansion and modernization in the gas distribution system. The ban was still on in mid-March. At that time, it appeared that Houston and the commission had reached a standoff.

Some background is pertinent. Houston Corp. took over the not-too-progressive or modern Miami-serving manufactured gas system, operated by Florida Power & Light Co., as part of the deal that brought natural gas to all of Florida for the first time. Florida Power & Light did not have a gas franchise from the city—it had lapsed and FPL either couldn't or didn't care to renew it. Houston Corp. assumed a gas franchise could be negotiated.

Officials of Houston Corp. trekked from St. Petersburg to Miami at least 12 times to discuss a franchise. Each time the matter was put off—at the city's request.

Initially, Houston's rates were approved without public hearings by Florida's Railroad and Public Utilities Commission. The approval was for a period of one year and had as its intent the formation of a one-year study period in which data on natural gas operations in Florida could be gathered.

However, soon after starting operations in Miami, Houston Corp.'s rates began to draw salvos. A particularly vocal salute was laid down by the Junior Chamber of Commerce. It alleged that: (1) Houston "misled" the state commission in its rate presentations, (2) replacement of the $1 minimum bill with a $2 minimum was inequitable and that domestic consumers were penalized to benefit industrials or other large users, and (3) Houston's policy of penalty on overdue bills and failure to pay interest on customers' service deposits were out of line.

Houston Corp. returned the fire by pointing out that Miami gas consumers, except for minimum users, saved some $73,000 during the first three months of natural gas service. And, it voluntarily withdrew its penalty provision and agreed to pay interest on customers' service deposits.

Sparked by the JayCees and others, Miami City Commission sought a public hearing reviewing Houston Corp.'s rates and policies by the Florida RR&PUC. In addition, the city wanted to take a look at the gas company's books, and brought up the matter of unpaid franchise tax retroactive to Houston's starting service—estimated to be in the area of over $40,000. Of more than passing interest is the statement by Houston Corp. officials that the city has never—to that date—formally requested payment of the franchise tax it claimed was due. And it is obvious that a franchise didn't exist.

Other pot-shots and broadsides were lobbed. A result was a Miami City Commission order preventing streets or sidewalks from being disturbed by Houston Corp.'s extension of gas mains and services. This shut down such work.

At a special meeting on March 7, the City Commission refused to lift the ban on expansion. And although Houston Corp. racked up some points when the Florida RR&PUC turned down the petition for a public hearing on Houston's rates and policies, the triumph failed to soften Miami's demands on the gas utility.

PUC Commissioner Edwin L. Mason, who prepared the state commission's opinion, ruled that "no public good could come from an immediate hearing." He made it very plain that only a few months of the one-year trial period remained, and that "it would seem folly to require the commission staff to prepare voluminous data for such a hearing when at the end of the period the data will be compiled anyway."

In the matter of opening its books to Miami's perusal, Houston Corp. has pointed out that its books are indeed open to the state public utilities commission and that that agency makes regular audits and receives regular reports from the company. Further, information requested by the Miami commission will come out at the public hearing before the state PUC at the end of the approved one-year trial period.

However, as mentioned, Miami commissioners were standing firm during early and middle March.

Houston Corp. was forced to lay off some 104 employees due to the hold order on expansion, and some 275 applications for gas service were delayed. At the same time, the city lost potential tax revenue during every day of the stoppage.

NONG surveys Ontario's future

AN industrial development survey has been prepared by Northern Ontario Natural Gas Co.'s industrial development and research division. The study has been sent to industrial development commissions and committees, chambers of commerce, banks, city officials, regional development groups, and other community leaders throughout northern and northwestern Ontario.

The statistical breakdown is based on studies from the Dominion Bureau of Statistics publications, imports of goods used by manufacturers, imports purchased by the average consumer, building activity, ship cargo import movements, and agricultural activity.

NONG Vice President E. C. Bovey said "The study is designed to help industrial development groups spot possible fabrication gaps within their economic environment.

"With a clear awareness of the quantities of imported goods used . . . and with a view towards manufacturing or growing some of these commodities locally, it is hoped that development groups will be able to intelligently prepare for the local establishment of suitable new industries."

Cascade continues expansion move

Pacific Natural Gas Co.'s merger with Cascade Natural Gas Corp., Seattle, has been agreed upon by directors of both companies. Approval is now needed from stockholders, regulatory commissions of Washington and Oregon, and holders of certain other securities.

The merger is expected to enhance chances of bringing natural gas to Aberdeen, Hoquiam, Montesan, Cosmopolis, Elma, McCleary, and Kalama, where Pacific holds franchises. Pacific headquarters in Long View, Wash.

With the addition of Pacific's 14 communities, Cascade will be serving about 20,000 customers in 42 Washington and Oregon towns.

Gas system planned

New York State Electric & Gas Corp. is building a gas transmission and distribution system to serve parts of Tompkins and Seneca counties, N. Y. The project will cost about $580,600.

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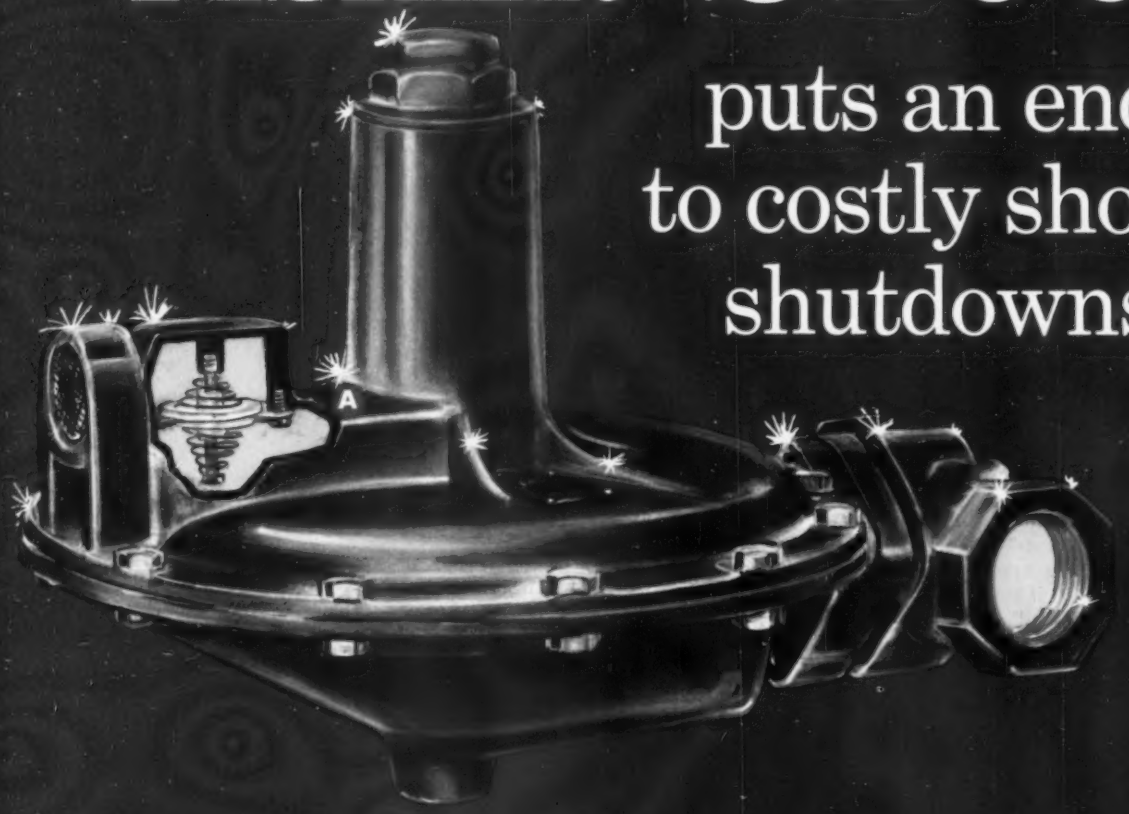

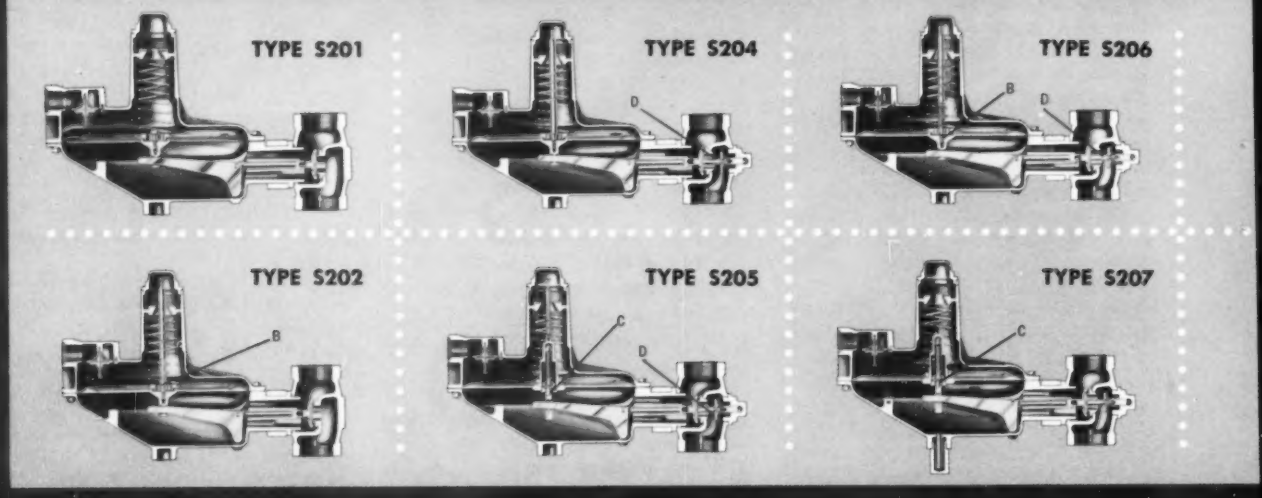

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A INSTANT RESPONSE . . . This new regulator series provides unmatched stability of operation under shock load conditions, even where demand variation is from practically nothing to several thousand CFH. Instant diaphragm response is assured by the exclusive two-way Fisher Stabilizer Vent Valve (see the cutaway illustration at left). This feature permits rapid expelling or drawing-in of air to diaphragm casing when abrupt diaphragm movement is demanded. Diaphragm lag is effectively eliminated. New Fisher Turbo-Booster Tube, open throat type inlet, provides instant registration of pressure changes on underside of diaphragm. Because of these exclusive features, the Fisher S200 holds shock pressures . . . either negative or positive . . . to limits that will not unnecessarily actuate safety equipment.

B INTERNAL RELIEF . . . Type S202 and S206 regulators have an internal relief valve which protects against over-pressure caused by partial malfunction of the regulator. Relief valve functions when downstream pressure exceeds regulator setting by 10" WC to 1 psi, depending on spring. See small illustration of Types S202 and S206.

C HIGH PRESSURE SHUT-OFF . . . When downstream pressure exceeds regulator setting by 13" WC to 1½ psi (depending on spring used), High Outlet Pressure Shut-Off trips and shuts off gas flow completely. This feature available on Types S205 and S207.

D LOW PRESSURE SHUT-OFF . . . Should inlet pressure fall to a point incapable of maintaining suitable outlet pressure, Low Outlet Pressure Shut-Off shuts off gas flow immediately. This feature available on Types S204, S205 and S206.

TYPE S201 . . . Outstanding feature of S201 is the exclusive, new Fisher two-way stabilizer vent valve. This device is also incorporated in design of all regulators in S200 series.

TYPE S202 . . . Has internal relief. Although not full capacity relief, valve functions at 10" WC to 1 psi over setting (depends on spring) and relieves until excess pressure is dissipated.

TYPE S204 . . . Incorporates low outlet pressure shut-off. On this type regulator, pusher post in spring casing is provided to permit manual resetting of regulator.

TYPE S205 . . . Identical to S204 except that it also includes high outlet pressure shut-off. This is reset manually, by removing closing cap and pulling upward on pusher post extension.

TYPE S206 . . . Internal relief valve and low outlet pressure shut-off. Low pressure shut-off is reset by removing closing cap and pulling upward on pusher post extension in spring case.

TYPE S207 . . . High outlet pressure shut-off is reset by removing cap at bottom of casing and pushing stem upward. Low pressure shut-off omitted to assure service even with low inlet pressures.

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S201 and S202	¼", ⅜" ½", ¾" 1", 1⅜6"	½ to 100	3½" WC to 3¼ psi
S204 and S206	⅝", 1" 1⅜6"	½ to 75	3½" WC to 3¼ psi
S205 and S207	⅝", 1" 1⅜6"	½ to 30	3½" WC to 3¼ psi

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SINCE 1880

Industrial seminar attracts management

Before World War II, utility salesmen were at the bottom of the totem pole, according to Henry I. Strauss, president of Henry I. Strauss & Co. But, postwar conditions have seen a change in management thinking. The sales force is being upgraded with a trend toward creative selling.

Strauss made his statement during the first seminar on "Selling Utility Services to Industrial or Commercial Customers." The seminar was conducted by the American Management Association in cooperation with the industrial and commercial gas section of AGA.

The workshop covered gas and electric service, transportation and communications. It was designed so that experienced operating executives could meet with those from other industries faced with similar problems and learn of successful systems and methods used.

The informal, off-the-record discussions were guided by F. A. Kaiser, vice president and general sales manager of Michigan Consolidated Gas Co., and Stanley F. Damkroger, assistant vice president, sales marketing department, American Telephone & Telegraph Co. Kaiser also is chairman of AGA's industrial and commercial gas section.

Some points brought out by the speakers:

Dilworth H. Walker of Cresap, McCormick & Paget: A marketing executive must be free to exercise assigned functions and must be given a free hand in the details of directing his staff.

W. W. Selzer, director of business promotion, Columbia Gas System Service Corp.: His company assigned an index code to each industrial customer and showed the relation of the index to that of the Federal Reserve Board. By this code, it is possible to estimate future demands of industrial customers in various classification of industries. "The analysis of industrial gas sales . . . indicates that monthly sales figures classified by industry provide an advanced analytical tool." Selzer also recognized that the problems in analyzing industrial sales will vary considerably among companies, depending on size, service area, contract provisions, and load characteristics.

F. A. Kaiser: Industrial and commercial sales program must interest consumers in such areas as economy over competitive services, labor-saving, convenience, better manufacturing techniques, and better working conditions.

Emil Hofsoos, of Ketchum, MacLeod & Grove: Unlike the emotional appeal of residential campaigns, the industrial-commercial pitch must be made by appealing to the pocketbook. Because gas companies can reach local prospects personally, management tends to hold down the amounts allotted to I-C advertising and promotion budgets. To the average company, industrial and commercial sales represent less than 8 per cent of total customers, but account for 63 per cent of the gas sold and 40 per cent of the sales revenues received. Exhibits and displays have considerable value, including those showing gas equipment and products made by using gas.

H. Vinton Potter, vice president of Oklahoma Natural Gas Co.; His company's commercial sales program, although launched in 1957, actually began a year earlier with analyses of the commercial market throughout its service area. ONG employed experts in hotel and restaurant fields to conduct lecture series for customers and prospects. Newest sales tool is a 50-ft trailer. The trailer already has carried the commercial sales story to about 55 of the 150 communities served by ONG. Nearly 1750 customers and prospects have seen the demonstrations.

G. R. "Jack" Walton, senior sales engineer of Houston Pipe Line Co.: Utilities must spearhead area development programs. Utilities can only be as large as the communities they serve. Thus it becomes imperative that the utility strive to bring more customers into its service area. This means launching an aggressive and effective program of area development, a broad-base, long-range program of community expansion. Jobs attract new residents to an area, but utilities themselves cannot provide many of these jobs. The answer: attract new industries and businesses.

John V. Fratus, training coordinator of Connecticut Light & Power Co.: Sales training is not a solution to manpower development. Class room training is the smallest part of the operation. The most important is on-the-job training from whence manpower development can be analyzed.

Ontario's new code in effect

Ontario's new gas safety code has gone into effect. It applies to 50 gas companies serving 487,198 customers through 8500 miles of pipeline.

The "Transmission and Distribution Piping Systems Code" becomes Ontario's first province-wide standard.

Provisions call for testing old pipelines and services, cutting off disused services, and regular pipeline inspection. The code specifies leak investigation procedures, governs maintenance of valves and regulators, and details requirements on the support and anchorage of buried and exposed piping.

It also outlines the kinds of material acceptable for piping systems as well as welding procedures to be followed. Limits and means of controlling gas pressures are specified.

Design, installation and testing of pipelines is spelled out, and the code states where compressor stations should be located and how they are to be built.

No penalties are included in the code. However, it gives inspectors authority to order installations they consider faulty ripped out and replaced.

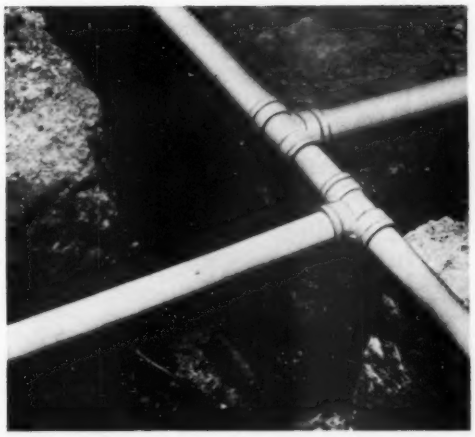
High performance burner subject of bulletin

Scheduled for April publication is a report on an experimental high performance type range top burner.

AGA Research Bulletin 80 outlines studies and tests performed by utilization, servicing, and home service departments of eight gas companies on an experimental burner design adapted to conventional ranges.

The bulletin, titled "Gas Company Experiences With the Experimental High Performance Burner," is available from AGA, 420 Lexington Ave., New York 17, for $2 per copy.

Found: THE ANSWER TO CORROSION, ELECTROLYSIS AND HIGH MAINTENANCE COSTS IN GAS LINES – *Kraloy high impact PVC Plastic Pipe provides permanent, trouble-free service at as little as 1/3 the cost!*



Narrow trenching and simple above-ground assembly of 2" mains are possible with lightweight KRALOY PVC Plastic Pipe Fittings are "welded" on with brush and solvent.

KRALOY PVC Plastic service pipe can be led off existing plastic main by simple tapping procedure and solvent-welded plastic service tee. KRALOY is immune to rust, rot, electrolytic action.

Gas industry experts are turning in increasing numbers to *the* pipe that has proven to be most versatile and trouble-free in both main and service pipe installations—KRALOY PVC High Impact Plastic Pipe.

Impervious to galvanic or other ground corrosive actions, unaffected by electrolysis, rot or rust—KRALOY not only gets rid of sour and dirty gas headaches, but likewise most efficiently conquers other gas piping problems. KRALOY is cheaper to install. Light in weight, its flexibility and ease of making joints and bends simplifies transportation, handling and laying.

FIGHTS BOTH SOUR GAS AND COSTLY SOIL CORROSION

Quality protected by continuous laboratory control, today's KRALOY Pipe is precision extruded from basic compounds best suited to the job. With its inert, non-conductor anti-rust, rot and corrosion characteristics—and its smooth, mirror-finish interior walls that permit faster, freer output (up to 20%) through smaller pipe sizes—today's KRALOY gives you the right combination of permanent, trouble-free qualities to pipe the greatest volume of gas at the lowest cost.

KRALOY GIVES YOU THESE FEATURES

1 KRALOY is permanent—not subject to electrolysis, rot, rust or scale . . needs no paint, coating, lining or cathodic protection . . has the ability to withstand all ground corrosive actions.

2 KRALOY's high impact strength withstands abuse before and after installation.

3 KRALOY's lighter weight (1/8 that of steel) enables 1-man handling, lets your trucks carry more pipe footage.

"Gas Does It Better, Naturally" . . *and even better* with KRALOY PVC Plastic Pipe! Available in all sizes from 1/4" to 12" with plastic fittings. Specify KRALOY for pipe *you can depend on* to do the job.

FREE—New 36-page Engineer's Handbook on PVC Plastic Pipe. Address Kraloy Plastic Pipe Co., Inc., Dept. GM-4, 402 W. Central Avenue, Santa Ana, California

R 59 71

NOTHING PIPES LIKE **KRALOY**

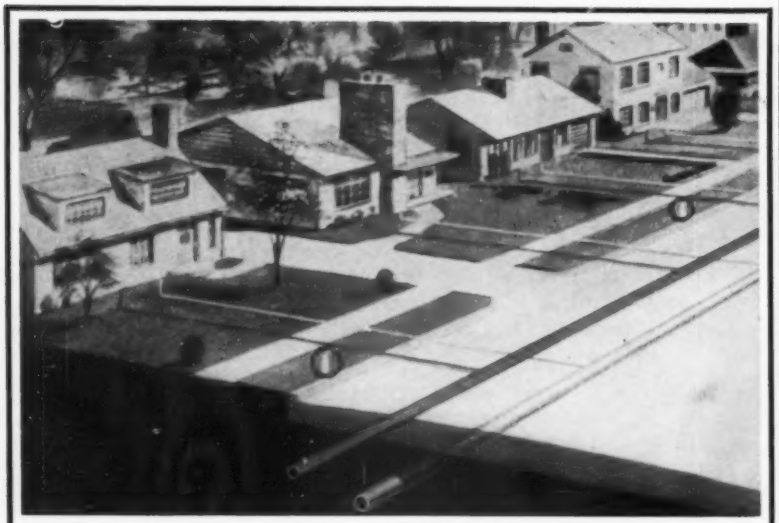
Robertshaw opens Mexico City plant

A Mexican subsidiary of Robertshaw-Fulton Controls Co. was expected to be in production late last month. Robertshaw-Fulton Mexicana, S.A. de C.V. will assemble and manufacture automatic precision control devices for the gas appliance industry.

The plant, managed by Russell F. Garner, is housed in existing buildings in Mexico City's Vallejo industrial zone. More than 10,000 sq ft of manufacturing space is available.

A winner

This AGA and member utilities poster won 3rd place in the miscellaneous classification at the 28th National Competition of Outdoor Advertising Art sponsored by the art Directors Club of Chicago.



HOW TO STOP LEAKS IN GAS & WATER DISTRIBUTION SYSTEMS

The external corrosion of underground pipe is a major headache in many areas. It can cause leaks, necessitate repairs, and even create potentially dangerous conditions. Cathodic protection has proved to be a successful and economical way to stop such corrosion—on transmission and distribution pipelines, oil and gas well casing, etc.

Magnesium anodes or rectifier systems are used to project a protective current onto the line or other buried structure. For distribution systems, magnesium anodes are usually preferred for their low cost and to avoid harming other nearby structures.

CSI engineers are pioneers in this field. They offer expert consulting and installation services, plus a complete line of brand-name materials and equipment for both anode and rectifier installations—including Dow's new high-potential Galvomag anodes.

Call or write today for estimates or quotations. Prices are competitive and there is no obligation, of course.

CSI

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795

CORROSION SERVICES INCORPORATED
General Office, Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
Tel. Circle 5-1351

NEGEA to build

A million dollar office building is planned for Cambridge, Mass., by the New England Gas & Electric Association. The five-story, 45,000-sq ft structure will serve as headquarters for the utility system and will contain offices of the NEGEA Service Corp.

Lynn Gas Co. formed

Lynn Gas & Electric Co. has been divided and the Lynn Gas Co. formed.

With the addition of Lynn Gas, the New England Electric System's gas division, headquartered in Malden, Mass. now has eight Massachusetts gas companies serving 240,000 customers.

Officers of Lynn Gas are Harold L. Dalbeck, president; Richard L. Fite, Jr., general manager; and Walter F. Devitt, treasurer.

Gas appliances in U. S. homes total 107 million

Nearly 107 million gas appliances are in daily service in U. S. homes, AGA estimates. More than 4 million of these were added in 1959.

Heating units of all types total 42.4 million, accounting for the largest portion of the gas-fueled home equipment currently in use. This group includes 11,950,000 central heating systems, 23,850,000 space heaters, and 6,575,000 floor and wall furnaces.

The new market analysis also shows 33,450,000 gas ranges, 23,900,000 water heaters, and 3,325,000 refrigerators in use. Gas clothes dryers number 2,875,000 units, incinerators about 525,000. Other residential equipment include about 300,000 modern gas lights and 27,000 central air conditioning systems.

'59 was big year for heating equipment

Homeowners bought more gas-fired furnaces and boilers for residential central heating during 1959 than in any previous year, GAMA reports.

Here is the breakdown:

	1958	1959	%
Forced warm air & gravity type furnaces	853,700	1,046,700	22.6
Boilers	123,200	136,200	10.6
Conversion burners	142,000	156,300	10.1
Total	1,118,900	1,339,200	19.7
Vented recessed wall heaters	389,000	448,900	15.4
Room heaters, etc.	1,395,900	1,463,100	4.8
Floor furnaces	97,500	97,000	—0.5
Unit heaters & duct furnaces	133,800	160,600	20.0

Northern Ontario signs for more Trans-Canada gas

Northern Ontario Natural Gas Co. Ltd. has a new contract with Trans-Canada Pipe Lines Ltd. calling for the firm purchase of up to 160.5 billion cu ft of gas. Value: $66.1 million.

Because the 17-year contract involves a firm delivery and such substantial quantities, Trans-Canada president James W. Kerr said it is "possible to sell it at an economic long-term price."

In addition to the firm gas contract, provision has been made for up to 344 billion cu ft of gas to be made available to NONG for the specific purpose of serving major industrial developments which are expected to materialize in northern Ontario.

Venting discussed

The first in a series of bulletins dealing with safe, modern methods of gas vent installations has been published by the Gas Vent Institute.

The first GVI bulletin discusses simplified theory of gas venting and basic principles of double wall gas vent operation.

Additional information on the series is available from GVI, 332 S. Michigan Ave., Chicago 4.

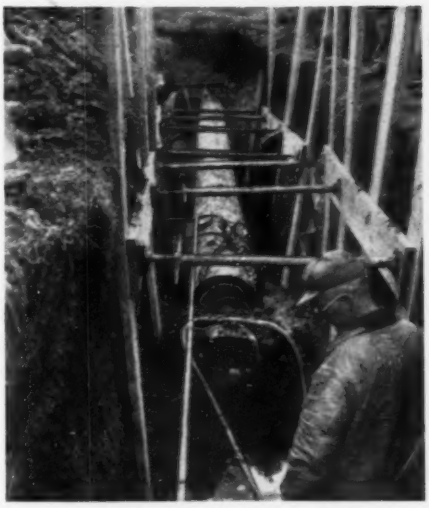
48′ BORE under highway for distribution line

with KA-MO 12″ dia. drill

To run a gas distribution line under main highway, a portable Ka-Mo horizontal drilling unit quickly bored a 12″ diameter hole, 48′ long, through hard compacted clay. Drill was powered by a 7½ h.p. air motor on standard double-track mounting. On similar type work, casing can be installed at the time hole is drilled, by using the casing attachment — giving maximum protection against costly cave-ins.

Ka-Mo offers tremendous versatility . . . light, portable drills . . . easy to operate for installing gas lines under streets, highways, railroads. Drills through sand, clay, gumbo, frost, shale, limerock, other mineral formations. Air, electric, hydraulic, diesel, gasoline engine powered.

100′ BORE and casing installation for gas main



This 20″ diameter Ka-Mo drill was used inside casing to bore a hole 100′ long through hard clay, under a railroad bed for new gas main. Drill was powered by a 15 h.p. air motor. Notice that drill and casing move forward at the same time.

Next time you have a drilling problem, check the Ka-Mo line. Drill sizes 2″ to 48″ dia. and larger, in sectionalized lengths are tailored to meet your own particular requirements. Information is available at no obligation. Fill out and mail coupon today.

Mail to: KWIK-MIX Co., Ka-Mo Tools Dept., Port Washington, Wisconsin

☐ Send us free 12-page KA-MO bulletin ☐ Have distributor call

NAME..... TITLE.....

COMPANY.....

STREET.....

CITY..... STATE.....

KAM906 GAS

KA MO KWIK-MIX COMPANY — Ka-Mo Tools Dept.

A DIVISION OF KOEHRING COMPANY

CUT 20" CAST IRON PIPE *in Less Than 8 Minutes...*

...with the New REED ROTARY CUTTERS

(4 sizes cover the range from 10" cast iron to 26" steel pipe)

These one-man Reed Rotary Cutters cut large diameter steel or cast iron pipe *faster and better than the heaviest power machines* . . . and without electrical or explosive hazards. What's more, there's less digging in ditch-work! You need only a 4" to 6" channel under the pipe and a 45° to 60° arc for the handle swing. Reed Rotaries are easy to "carry in", too. The 20" size weighs only 68 pounds; separates into 3 easily carried parts. Patented pipe guide assures clean, right-angle cuts. Four razor blade wheels track perfectly, cut easily and are quickly interchangeable for steel or cast iron pipe.

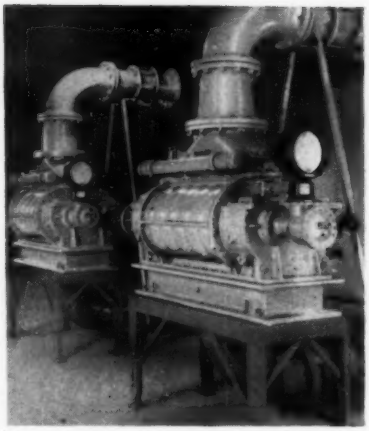
● Write today for descriptive literature.

These typical cuts on 12, 16, 20 and 24" cast iron pipe illustrate the clean, accurate, right-angle cuts provided by Reed Rotary Cutters.

REED

REED MANUFACTURING COMPANY

ERIE • PENNSYLVANIA



These two rotary positive gas meters handle a gas load averaging more than 200 Mcfh in Denver's Hilton hotel.

New measurement concept used in Denver hotel

The largest meter installation in a U. S. hotel is in Denver's new Hilton. Installation of two Roots-Connersville rotary positive gas meters is termed by Public Service Co. of Colorado "a new concept in gas measurement."

Four gas-fired boilers provide some 140,000 lb per hr of 200 psig steam for space heating, turbine-driven centrifugal air conditioning, and other hotel services. Substantial surplus steam goes for resale to nearby commercial buildings through the utility's steam distribution system.

Advantages claimed by the installation:

1. First cost of equipment cut.
2. Floor space requirements reduced to fractional part of the original allowance.
3. Simplified installation.
4. Reduced weight of rotary meters.
5. Enhanced appearance of meter room.

The two 10 x 30 R-C meters handle a gas load averaging more than 200 Mcfh. Providing accurate measurement with as much as a 100:1 turndown, these units can easily take care of any expected load fluctuations.

Built-ins tops in '59

The 355,100 built-in gas ranges shipped in 1959 made last year the best ever for that appliance. Combined shipments of both built-in and free-standing models totaled 2,016,900, a 6.3 per cent improvement over the 1,896,500 reported for 1958, according to GAMA.

When you install services -use a REAL saddle!

Massive malleable iron construction. Hinged on one side. Single oversized plated bolt. Simplicity itself. Full contour contact—can't crush.

New "pillow" type neoprene gasket bonded inside cast retainer rings, preventing cold flow or blowing out under high pressure.

Each saddle pressure-formed to a perfect circle fit, soap-and-water tested. Write for special Folder SSS.

GEM

M. B. SKINNER CO.
South Bend 21, Ind.

SKINNER-SEAL SERVICE SADDLE

RUGGED CONSTRUCTION— Made from extra rugged, high strength steel or certified malleable iron, steel retainer ring and heavy end-nuts . . . shipped assembled, ready-to-use.

SUPERIOR GASKETS— Specially compounded for gas service, Dresser gaskets last as long as the pipe itself. They are continuously tested for plasticity, resiliency and low permanent set.

ABSORB PIPE DEFLECTION— Up to 6° pipe deflection at each joint! Vastly simplifies joining in cramped quarters, fittings 100% air-tested to provide a perfect, leak-proof seal . . . permanently!

Bury your service line problems for good...with DRESSER® fittings

• The design of Dresser Service Fittings provides for gasket sealing pressures greatly in excess of recommended line working pressures, with ample margin for permanent safety. The economy of their maintenance-free performance has been time-proved on millions of service lines across the country. Safe, simple and fast: corrosion-resistant Dresser Service Fittings let you bury your worries when you backfill the trench. For specifications, product properties, illustration of the *complete* line, and a summary of standard, current practices, send for your free copy of the Dresser Gas Service Fittings catalog form No. 5210.

FROM MAIN TO FLAME: A Superior Fitting for Every Need

Bradford, Pennsylvania
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DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES®

Top winner of the New York Mirror-Brooklyn Union Gas Co. international receipe contest, Mrs. Gloria Sarkisian, picks her new gas range, feature by feature. Helping her is Julius Klein (right), president of Caloric Appliance Corp., while William E. Hand of Brooklyn Union looks on. Mrs. Sarkisian's recipe was judged best by BU home economists over more than 5000 entries in the eight-week contest which featured recipes of 16 different nationality groups. First prize was a gas range built to the winner's specifications.

Measurement course set for U. of Oklahoma

AGA President Wister H. Ligon will be the principal speaker at the Southwestern Gas Measurement Court Course slated for April 19-21 at the University of Oklahoma, Norman. Ligon also is president of Nashville (Tenn.) Gas Co.

The three-day short course consists of 89 class sessions, both technical and non-technical.

It is estimated that attendance will hit the 1000 mark for this, the 35th annual session.

In addition to class sessions, the meeting will feature a number of gas measurement equipment displays. This year's session will mark the first time that educational mass flow gas measurement equipment has been shown.

Additional information on the course is available from W. H. Carson, dean of the college of engineering, at the University of Oklahoma, Norman, Okla.

Study of utilities proposed in Nevada

Nevada is studying a bill which calls for the State Legislative Commission to investigate the state's public utilities.

The investigation would cover all phases of operation, including whether utilities make a true and accurate report of their investments to the Nevada PSC. It also would check deductions previously claimed by companies for depreciation of capital investments and earnings; whether utility rates can be lowered to correspond with "lower rates of neighboring states"; and whether there are obsolete gas and water lines which may be hazardous.

Norge plans Arkansas plant

Norge Division of Borg Warner Corp. will build a new plant in Fort Smith, Ark. The 1-million-sq ft plant will produce Norge's new gas refrigerator and other gas appliances.

A serious effort to rally gas men into a unified front against competition from the electric industry is being made by Empire Stove Co.'s Lee Brand. He has chosen the battle-cry "Advance the gas flame . . ." as the theme of a 7-point program calculated to increase the selling power of the gas industry. Brand's attack is a grass-roots movement on the part of dealers and distributors, strongly supported by manufacturers and suppliers.

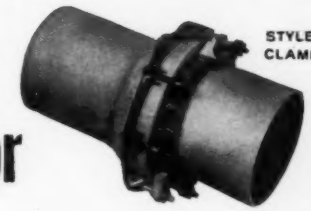
There is a Dresser®

STYLE 38
6-BOLT COUPLING

pipe coupling, fitting,

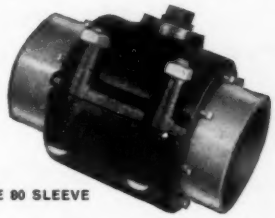
STYLE 90
STREET
TEE

repair clamp, or



STYLE 60
CLAMP

repair sleeve



STYLE 80 SLEEVE

for every need

Only Dresser manufactures a complete line.

DRESSER
MANUFACTURING DIVISION
Bradford, Pennsylvania

GAS·PEOPLE

D. A. Crawford
Atlanta Gas

R. G. Taber
Atlanta Gas

W. L. Lee
Atlanta Gas

Russell Young
J. F. Pritchard

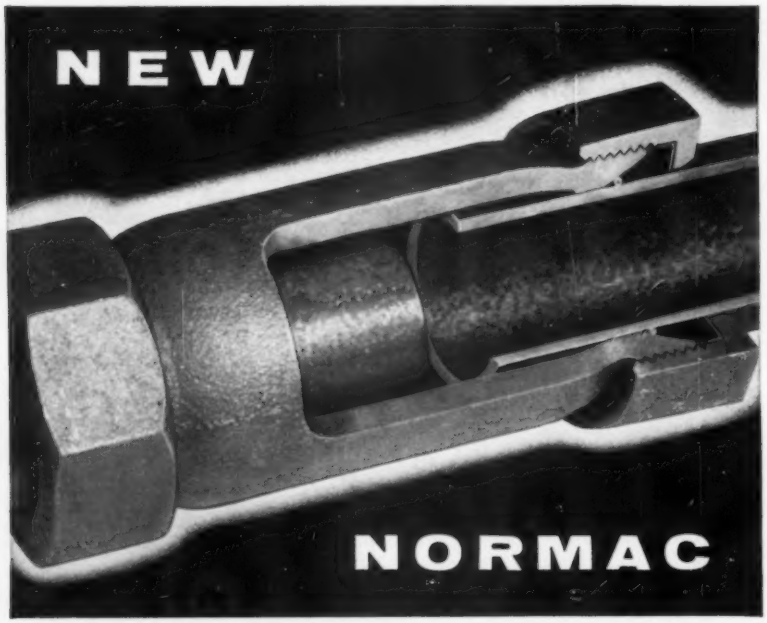
D. A. CRAWFORD has been elected president of Atlanta (Ga.) Gas Light Co. He succeeds R. G. TABER, named to the new post of chairman of the board. Crawford joined Atlanta in 1943 as vice president in charge of all properties outside Atlanta. Two years later he was named operating vice president for the entire system, and in 1956 was elected executive vice president. He also became a director in that year. Taber joined Atlanta in 1944 as operating vice president. In 1945 he was elected president and in 1947 became a member of the board. The company also named W. L. LEE to succeed Crawford as executive vice president. Lee, until now a vice president, also was named to the board.

A. RUSSELL YOUNG has been appointed assistant executive vice president and general manager of J. F. Pritchard & Co., Kansas City, Mo. With Pritichard since 1938, Young has been vice president in charge of the gas division since 1954. He also is vice president of the Constock-Pritchard Liquefaction Corp., formed to develop plants and facilities for all phases of natural gas liquefaction.

New advertising assistant at Southern Counties Gas Co., Los Angeles, is JOHN A. MASON. He will assist Don Robertson, advertising manager.

GLEN E. WALSWORTH, manager of the Puyallup office of Washington Natural Gas Co., has received his firm's "Presidential Commendation," an annual award presented to an outstanding employee of the company. In presenting the commendation, President Charles M. Sturkey stressed the "phenomenal increase in natural gas used in the Puyallup area during the past year." Walsworth joined Washington Natural in 1953 in the accounting department in Tacoma. He became manager at Puyallup in 1956.

Several changes have been made in the home service division of Michigan Consolidated Gas Co., Detroit. IRENE HICKEY, former director of home service and executive advisor, is retiring after more than 30 years with the company. FRIEDA BARTH, director of home service for Michigan since 1947, is now executive advisor in the division. PEGGY LEWIS, completing 10 years with the company, was appointed director of home service.



MODERNIZED Extra Heavy Wall
All-Malleable COUPLING
Provides More Deflection Than Ever

Engineered in line with latest data on distribution pressures and installation ease. Inspect its construction and quality materials in detail. (Available with Normac INSULATING gaskets).

BRASS FITTINGS
IRON BODY COCKS
INSULATING GASKETS
SELF-LOCKING JOINTS
BELL JOINT CLAMPS
SERVICE TEES, ELLS
METER BARS
COUPLINGS

MALLEABLE SERVICE ELL
Maximum stab. All sizes, with or without insulating gaskets. Also in brass 1¼ I.P.S.

BRASS FITTINGS
The most complete line for copper or plastic tubing in ⅝, ⅞, 1⅛, 1⅜ O.D., 1¼ I.P.S.

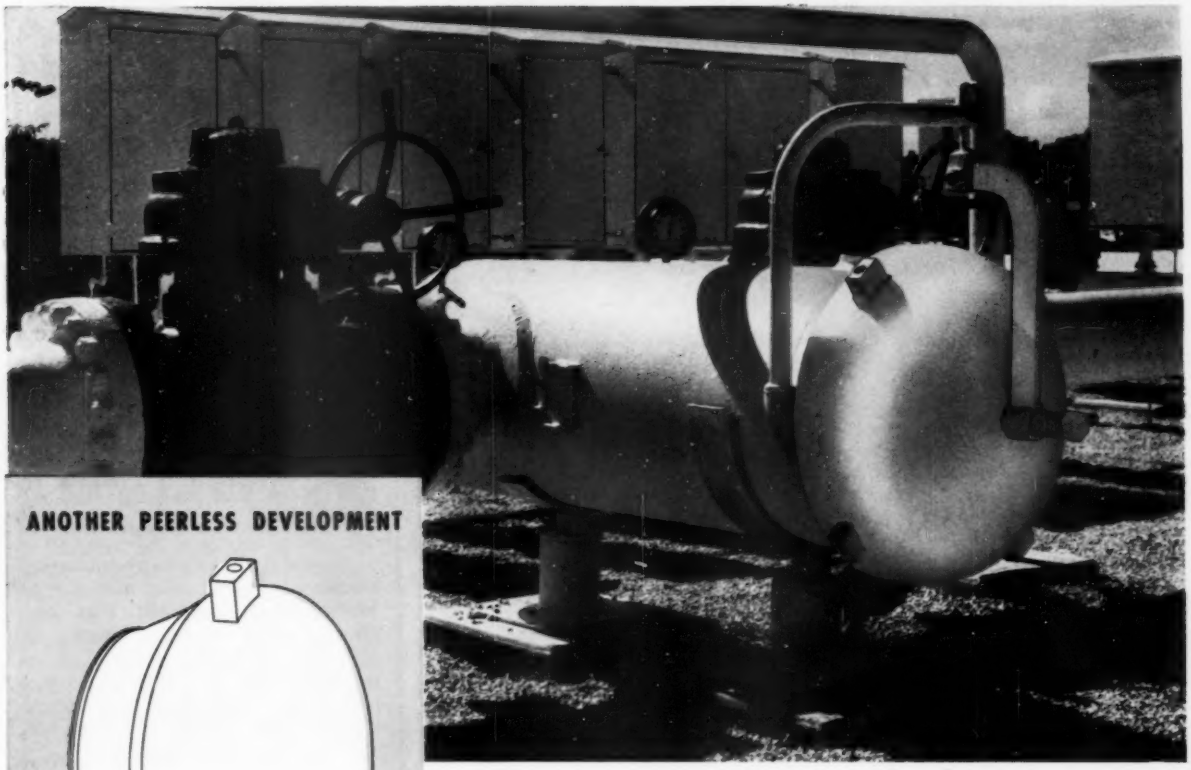
Top Quality for 22 Years in Gas Distribution Equipment

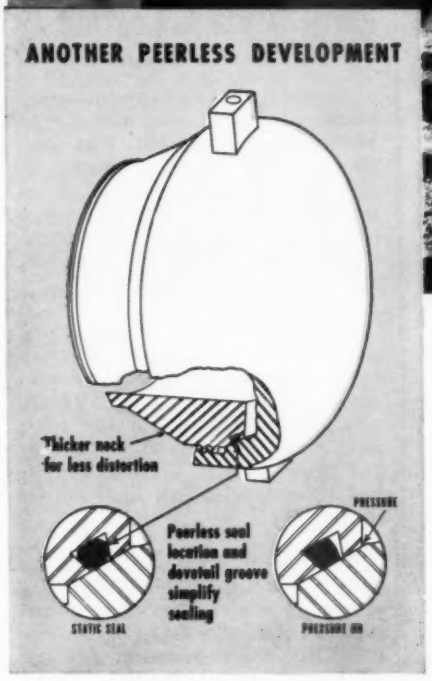
Get helpful CATALOG 12. Photos, specs, detail drawings & much helpful data for modernizing or new installations.

PERMANENCY Rely on NORTON-McMURRAY for the finest! NORMAC continues to modernize and improve couplings and fittings in step with latest gas distribution demands. 22 years experience concentrated on ONE purpose . . . the BEST! Today, major gas distribution companies say "NORMAC" to define their standard of quality.

NORTON - McMURRAY Mfg. Co.
919 N. Michigan Ave • Chicago 11, Ill.

New Peerless O-Ring Closure Design assures fast, tight seals at low cost





The Peerless O-Ring Closure includes exclusive design features that field experience has shown are essential to easy dependable operation.

1. The cap is a weld cap which eliminates the usual casting and makes possible lower initial cost.
2. Tapered seating surface speeds assembly.
3. Dove-tailed groove keeps O-Ring in place if swollen.
4. Outside position of seal ring reduces possibility of sealing surface damage.
5. Heavy cross section of weld neck prevents distortion.
6. Hinges are factory installed.

Write for Bulletin today!

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SEPARATORS:
Liquid Vapor
DUST SCRUBBERS:
Wet and Dry Types
GAS FILTERS
GAS ODORIZERS
SILLERS CLOSURES
OTHER PRODUCTS:
Engine Timers, Scraper Traps, Manways

PEERLESS MFG. CO. OAKLAND TEXAS

PEERLESS MFG. CO.

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P. O. Box 13165 • Dallas 20, Texas

record-breaking tunnel job *fully protected*

For lifelong dependability in a vital power generating installation, these 13-foot diameter penstocks were lined, coated and wrapped by Hill-Hubbell corrosion protection experts.

Whether yours is a large or small diameter installation, the best possible protection you can specify is Hill-Hubbell, the name synonymous with quality in mill coated-and-wrapped pipe.

Specify Hill-Hubbell wrapped pipe on your next job . . .

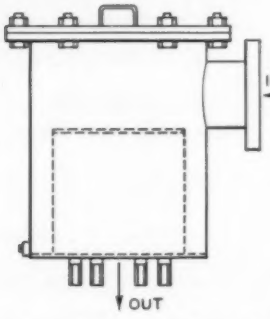
HILL·HUBBELL

DIVISION OF GENERAL PACIFIC CORP.

3091 MAYFIELD RD. · CLEVELAND 18, OHIO · YELLOWSTONE 2-7535

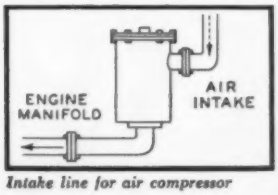
IN-THE-LINE FILTERS

dry-type, oil-wetted and oil bath types

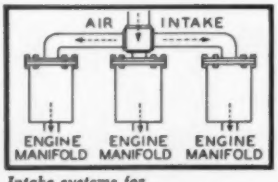


A line of filters for "in-the-line" or "closed circuit" operation is manufactured by The Air-Maze Corporation. Built for efficient filtration of air and gases, these filters are incorporated on remote air intake lines for engines, compressors or industrial heating furnaces. They are used for the filtration of fuel gas to engines; and for filtration of natural gas on transmission or gas processing applications. Cleanable, dry-type units are available for extremely fine filtration, where dust loads are low or where oil must be absent from the gas stream. Oil-wetted and oil bath types available where dirt loads are higher and where continuous low pressure drops are mandatory.

Write for bulletins. The Air-Maze Corporation, Dept. GM-4, Cleveland 28, Ohio. (Subsidiary of ROCKWELL-STANDARD Corporation)



Intake line for air compressor



Intake systems for multi-unit compressor station

Joseph Burns
Michigan

Art Nepstad
North Shore

ART NEPSTAD has joined North Shore Gas Co., Waukegan, Ill., in the newly created post of air conditioning representative. He will coordinate air conditioning activities for the company, instituting North Shore's first air conditioning sales program.

JOSEPH J. MCDONOUGH has been named district manager for the Norge Division of Borg-Warner. He will cover central and western New York and western Pennsylvania.

JOSEPH G. BURNS has been named assistant general sales manager of Michigan Consolidated Gas Co., Detroit. He succeeds ROGER J. KARCHER, a 43-year veteran of the company who is retiring. Since last June, Burns has been executive assistant to the vice president and general sales manager.

ROBERT K. BROWN is now superintendent of Philadelphia Electric Co.'s Delaware division. He succeeds LAWRENCE T. CHAMBERS, who has retired. With the company since 1946, Brown worked in gas production in Chester and in gas transmission and distribution in Morton.

WILLIAM H. NEAL JR. heads the newly established industrial development department within Western Kentucky Gas Co., Owensboro, Ky. The department will try to locate new industrial plants within the 60 Kentucky communities served by the company. In addition, a community development program will be launched under Neal's direction.

PUTNAM B. MCDOWELL has been elected vice president-administration, of Pittsburgh (Pa.) Coke & Chemical Co. He formerly was assistant to the president.

J. M. GIFFORD has been appointed personnel director of the Consumers Gas Co., Toronto, Canada.

A. M. Wiederkehr
Southern Union

A. A. Steinle, Jr.
Heath

A. A. STEINLE JR. has been promoted to staff assistant to the vice president in charge of operations at Heath Survey Consultants Inc., Wellesley Hills, Mass. He formerly was district supervisor.

HARRY D. FERGUSON is purchasing agent at Rockwell Manufacturing Co.'s Instrument Division in Tulsa, Okla.

MERRILL ELY has joined Honolulu Gas Co. as sales engineer. For the past nine years, Ely served as heating engineer with Northwest Natural Gas Co., Portland, Ore.

ERNEST M. WEBB has been appointed field engineer by the Peerless Manufacturing Division of Dover Corp. Webb has been a sales engineer for the Dura-Vent Corp., a Peerless affiliate, since 958. He will continue in that capacity in Kentucky and Tennessee.

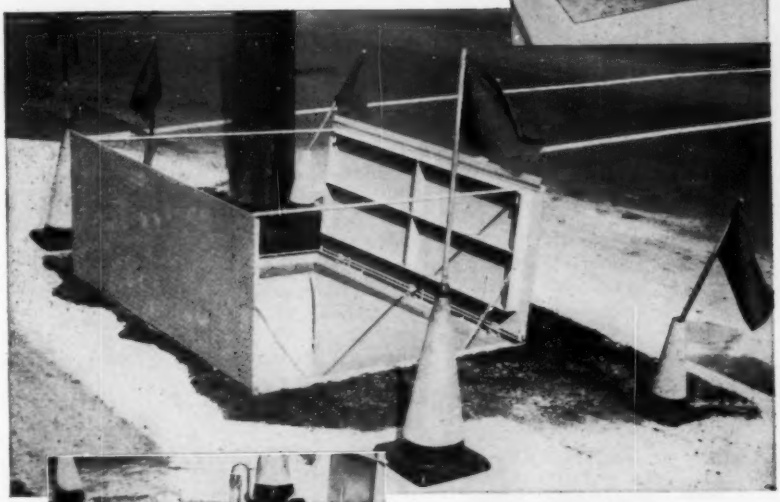
A. M. WIEDERKEHR has been elected vice president, exploration, of Southern Union Gas Co., Dallas. He will be in charge of the company's land, geological, drilling and production departments. Wiederkehr joined Southern Union in 1952 as reservoir engineer and in 1954 was named head of the exploration department.

WILLIAM J. GREDE has been elected president of J. I. Case Co., succeeding MARC B. ROJTMAN, who assumed the post of special advisor to the president and Case executive committee.

Dollinger Corp., Rochester, N. Y., has promoted JOHN J. HART to chief engineer. E. GRANT PIKE succeeds him as research director.

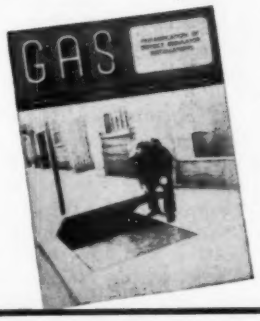
RALPH A. LARSEN is chief design engineer of Stone & Webster Engineering Corp., New York. He succeeds CHARLES D. LILBURN, who is now design consultant.

easiest access to regulators under-the-sidewalk



SPRING-BALANCED BILCO DOORS ARE EASY-TO-OPEN AND COMPLETELY WEATHERTIGHT

Bilco vault doors are the safe choice for gas regulator vaults underfoot. More and more gas companies are finding that Bilco doors wear better, keep water out. When opened they provide maximum ventilation for service men's safety. Built-in drainage and easy maintenance add up to another Bilco bonus—and every Bilco door swings open easily because it's *spring-balanced!*



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New Haven 5, Conn.
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Send catalog with details of Bilco sidewalk doors ( )
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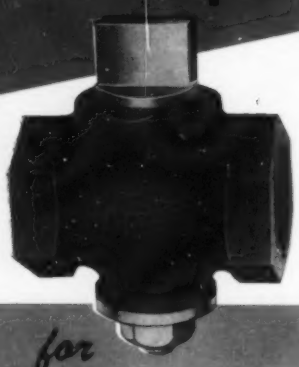
Gas Stops



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with Square Head

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LUBRICATED PATTERNS

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.

M. B. Skinner Co., South Bend, Ind., has elected the following officers: K. G. MERRILL, chairman of the board; F. R. MCMURRAY, president; and H. T. WAITE JR., vice president, sales.

W. L. PARCELL has been elected executive vice president of Ridge Tool Co., Elyria, Ohio. Other appointments include R. D. FYE, sales manager; and H. L. PALMER, advertising manager and assistant sales manager.

RALPH A. DORA has joined the industrial gas chromatography group of the Scientific and Process Instruments Division, Beckman Instruments Inc., Fullerton, Calif. Dora will work as a project engineer in industrial gas chromatography.

H & H Sales & Engineering Co., Houston, has named EDWIN A. ROMAN to the post of general manager. H & H is a distributor of Plicoflex laminated tapes. Roman formerly was with Plicoflex as service manager.

WILLIAM W. HOWARD has been named sales manager of gas and electric dryers by Whirlpool Corp., St. Joseph, Mich. New sales manager of gas and electric combination washer-dryers in JOHN W. BENSON.

E. W. HUBERT has been appointed national sales manager of combination washer-dryers by Norge Division, Borg-Warner Corp., Chicago.

ED PARKES, president and director of United Gas Corp., Shreveport, has been elected a director of the First National Bank of Shreveport.

General Controls Co., Glendale, Calif., has made several new appointments. WILLIAM J. LORD moves to company headquarters as assistant sales manager for the gas heat controls division. L. O. LIEPIN is now heating and air conditioning account executive for the eastern region. He headquarters in Washington, Pa. The company has established a San Diego (Calif.) area resident office. Supervisor of the operation is DON WOLFE, new field representative for San Diego. New vice president of General Controls' Canadian operation is GEORGE CROTHERS, who is also general manager with headquarters in Guelph, Ont.

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

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CHICAGO 8, ILLINOIS
Elizabeth, New Jersey

J. H. Cantlin
Wilcolator

A. M. HOOVER has been named president of the Wilcolator Co., Elizabeth, N. J. J. H. CANTLIN, vice president in charge of engineering, was named executive vice president.

EARL A. ERICH has been elected vice president of Tube Turns Plastics Inc., Louisville, Ky.

WILLIAM R. PRINGLE, secretary of East Ohio Gas Co., Cleveland, is head of the company's new area development department. He will implement and coordinate the new area development program of the Consolidated Natural Gas Co. in the 179-community area served by East Ohio.

JOHN T. PINKSTON has been elected a vice president of United Engineers & Constructors Inc., Philadelphia.

JOHN P. WRIGHT has resigned as president and WILLIAM C. WAGGONER has resigned as vice president and treasurer of Geo. D. Roper Corp., Kankakee, Ill. STANLEY H. HOBSON, chairman of the board, becomes president, and W. G. VUKSNIC becomes treasurer.

CHARLES W. ENGELHARD, chairman and president of Engelhard Industries Inc., has been elected a member of the board of Public Service Electric & Gas Co., Newark, N. J. He succeeds the late HORACE K. CORBIN.

THOMAS H. JEFFERS has been named director, facilities and tooling, by Robertshaw-Fulton Controls Co., Richmond, Va.

Deaths

JOHN V. POSTLES, retired vice president of Philadelphia (Pa.) Gas Works, died recently. He retired in 1952 following 38 years of PGW and United Gas Improvement Co. service. When he retired, Mr. Postles was vice president in charge of production.

Compact RIDGID
300 Power Drive
with Accessories

Portable, Fast and Easy-to-Use, Low Cost. 1/8" to 2" Capacity; Power for up to 12" Geared Tools

Here's such an amazing power package that you'll have to try it to believe it. It's built around the compact, rugged RIDGID 300 Power Drive with famous RIDGID Speed Chuck that grips tight—forward or reverse, yet sets and releases easily by hand. Cam-action rear centering device holds even long lengths centered for perfect threads every time. Sturdy No. 1206 Stand folds for easy carrying . . . is extra rigid when in use.

RIDGID No. 310 Carriage, made of strong aluminum alloy, slides smoothly on drive support arms . . . holds die head and cutter ready for instant use. Snugs up tight to chuck for close threading and cut-off.

RIDGID 535 Quick-Opening Die Head, shown here, threads ½" to 2" pipe with just 2 sets of dies . . . adjusts to size right in machine . . . no fumbling for right size threader . . . no slow back-off. All other RIDGID Machine Pipe and Bolt Die Heads can be used. Add a RIDGID No. 19 Nipple Chuck, and you can thread close nipples.

RIDGID 360 full-floating Cutter has slide action that adjusts to all pipe irregularities . . . wide rolls for straight cuts at machine speed. Capacity: ¼" to 2" pipe and conduit—⅜" rod. E-1032 wheel for 1" rod available.

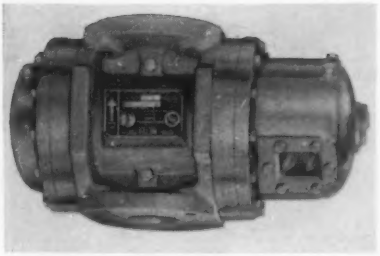
See and try this time-and-work-saving RIDGID 300 group at your Supply House!

RIDGID
The Ridge Tool Company, Elyria, Ohio, U.S.A.

GAS DIGEST

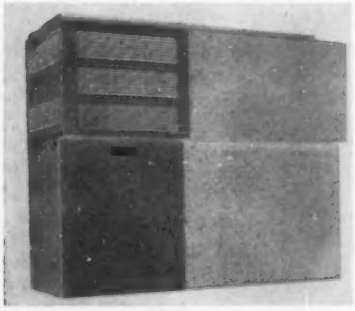
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 87, 88



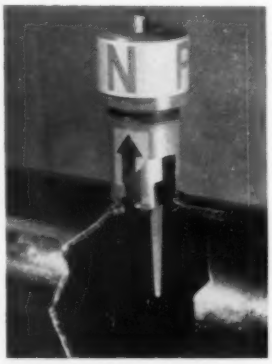
1. Rotary gas meter

Roots-Connersville's new 3M125 meter employs a new concept in rotary-type positive displacement gas meter design aimed at accurate metering at lower cost. Described as "just a bulge in the line," the new unit can be flange mounted directly in either a horizontal or vertical gas line without need for additional support, and provides straight-through gas flow. It has a flow range to 3000 cfh. This, combined with a working pressure rating of 125 psig, is intended to adapt this meter to measurement of many industrial and commercial loads for which rotary-type meters have not previously been available. *GEC-560*
Roots-Connersville Blower Div.



2. Chiller-heater

Arkla's new direct-fired, 25-ton gas chiller-heater has a refrigeration capacity of 300,000 Btuh and a heating capacity of 400,000 Btuh. Model DF-3000 eliminates the need for steam boilers, condensate pumps, and steam and condensate piping. Arkla has designed an entirely new absorption package around an already proven absorption cooling system. Many of the same components used in steam models are in the DF-3000. The principal differences lie in the method of firing and the addition of a heating cycle. *GEC-020*
Arkla Air Conditioning Corp.

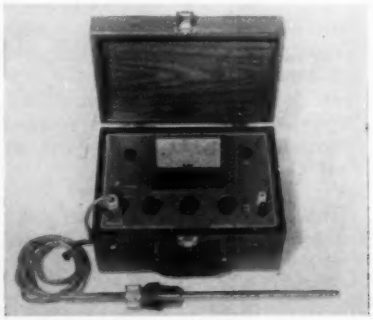


3. Pig indicator

T. D. Williamson has developed a new scraper passage indicator. Although operating on the same principle as the original WmSON Pig-Sig, the Pig-Sig II has new design features: It is more compact and can be installed and removed under line pressure; the longer trigger detects scrapers in oversize pipe or scraper traps; operation direction may be changed under pressure. *GEC-200*
T. D. Williamson Inc.

4. Two-way radio

Motorola is expanding its line of Motrac two-way radios with the introduction of a 100-watt unit to operate in the low band (25-54 mc) frequencies. Motorola now has a complete line of units for operation in both low band and high band frequencies. Besides the new 100-watt unit, the company has 25- and 50-watt models in low band, and 30-, 60-, and 80-watt models in high band. *GEC-140*
Motorola Inc.



5. Gas velocity meter

Continuous, accurate measurement of the mass velocity of gas as it passes through a pipe is given by Flow Corp.'s new gas velocity meter. Model 51A1 is primarily designed and especially calibrated for use by gas utilities. To get a velocity reading, it is only necessary to insert a probe containing the sensing unit into the pipe. The gas velocity is then read directly on the meter. Flow direction also can be determined by the instrument. *GEC-540*
Flow Corp.

6. Mechanical ability

Aptitests has developed a new Mechanical Knowledge Test which provides an index of mechanical background and experience. It can be used to provide information on which to base hiring, placing, and promoting decisions. Test 6-A is designed to help reduce errors in these decisions to a minimum for more effective personnel administration. *GEC-450*
Aptitests

7. Ditcher

Barber-Greene's Model 750 Ditcher is a high-speed, heavy-duty pneumatic-tired, vertical boom machine. It digs up to 2 ft wide and 6 ft deep. During its development, the machine was tested and operated at temperatures ranging from 125 deg F to —32 deg F. It can dig at high-speed in difficult materials, including caliche and coral rock. *GEC-210*
Barber-Greene Co.

8. Prime mover

Ottawa Steel's Commando is a basic prime mover for many jobs, serving as a truck, power crane, aerial tower, fork lift, tractor, bulldozer, snow plow. A variety of Uni-Tools is available for the Commando. (Shown is the Hydra-Hammer.) Each tool becomes a completely self-contained, self-propelled unit. *GEC-210*
Ottawa Steel Division

9. Trencher

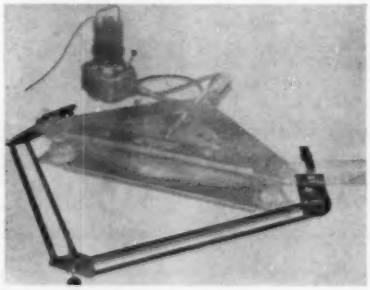
Model MA-2 Trench Devil from Arps Corp. is a one-man trencher designed for a variety of jobs. The heavy-duty trencher weighs about 1080 lb. It can be easily skid-loaded on pickup trucks or small trailers, or it may be transported for short distances under its own power. *GEC-210*
Arps Corp.

10. Trencher-backfiller

A new crawler-type trencher and backfill machine has been introduced by Davis Mfg. Inc. Davis' T-66 features positive traction, hydraulic variable speed drive, instant forward and reverse. It digs 3 to 4 in. wide, down to 66 in. deep; or 12 in. wide, 30-in. deep, and at varying widths and depths between. *GEC-210*
Davis Mfg. Inc.

11. Wheel loader

Cat No. 944 Traxcavator is the first of an all-new line of wheel loaders from Caterpillar. Most apparent feature of the new machine is location of all lift arms and hydraulic cylinders ahead of the operator's compartment. It is powered by either a gasoline or diesel engine. *GEC-210*
Caterpillar Tractor Co.

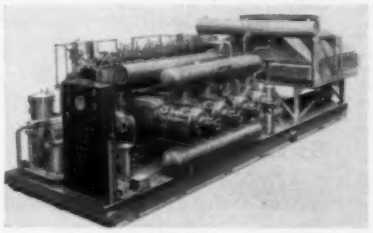


12. Pipe bend scale

Greenlee has a scale that quickly and accurately indicates degree of bend on any ½- to 6-in. diameter pipe. The No. 1807 pipe bending degree indicator fits any hydraulic pipe and conduit bender operating in a horizontal position. *GEC-650*
Greenlee Tool Co.

13. Dustless drilling

Le Roi's new drilling and dust collecting assembly is for use in gas leak detection work. The unit is designed to mount on a Le Roi Tractair. Leak detection or other drilling can move along at a much faster pace. By eliminating abrasive concrete dust, the system prevents complaints from car and homeowners. *GEC-210*
Le Roi Division

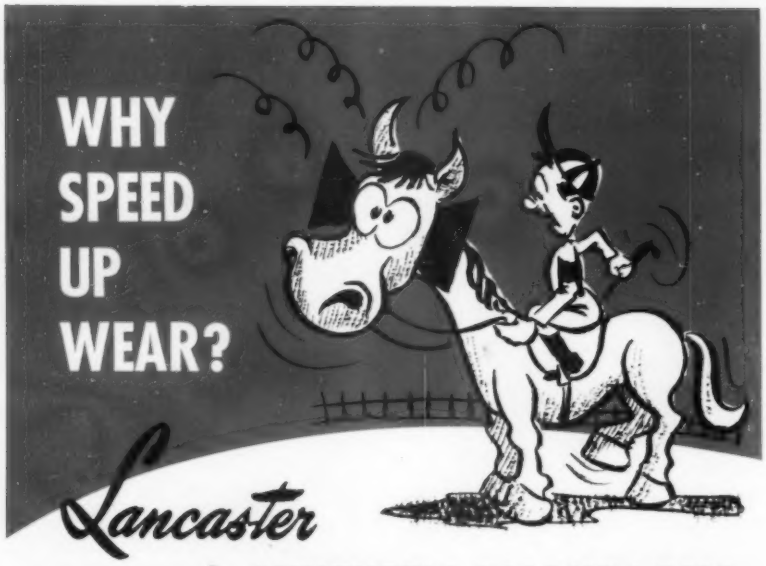


14. Control panels

A new series of automatic control panels from Clark simplifies operations of the company's HMB-TMB packaged field compressors. The control consists of a complete pneumatic starting and stopping system which operates on 75 psi air or gas pressure. It is furnished as an integral part of the compressor package. *GEC-170*
Clark Bros. Co.

15. Pipe tape

A new pressure-sensitive pipe protective tape can be applied at temperatures as low as —5 deg F. Scotchrap Tape No. 40 is designed for conformability over a broad temperature range, with optimum properties for corrosion prevention. The tape gives positive protection of joints, tees, and couplings without the use of heat or tools *GEC-130*
Minnesota Mining & Mfg. Co.



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improve gas meter accuracies
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or standard parts

High flexibility, low differentials and superior performance proved in both service and laboratories are built right into Lancaster diaphragms S-7-L (and S-700-L with carrier wire and gaskets attached) for Sprague 1-A Gas Meters.

There's no cloth lining, no fabric failure . . . gas meters can keep operating at the speed they were designed for! No need to hurry up meter wear.

Lancaster's superior synthetic materials are also available in these diaphragms: C-1-L for #1 Ironclad, O-L for #0 Emco and #1-L for #1 Emco Meters.

Increase meter accuracy . . . without increasing meter wear —Order Lancaster Synthetic Diaphragms!

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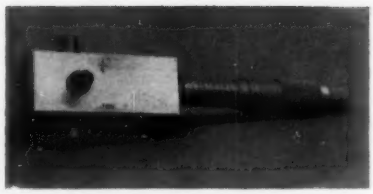

16. Tap-hole micrometer

A new tap-hole micrometer has been designed for measuring the distance between the center of a pressure tap hole and the face of an orifice plate in orifice fittings and flanges. Measurement is in thousandths of an inch in the range of .750 to 1.750 in. The micrometer can be operated with one hand. Plugs and rod wear-surfaces are hardened and ground for long-lasting precision. *GEC-540*
Hock & Sahr

17. Control package

General Controls has introduced "Kupl-Pac," a combination variety pack, shipping carton, and counter display for gas appliance thermocouples. There are 10 packages of assorted thermocouples in each carton as well as a variety of adaptors and snap rings which permit the 'couples to be used with any pilot burner. *GEC-550*
General Controls Co.

18. Chemical control

Chemicator is a new concept for feeding balanced chemical treatment into circulating water systems of cooling towers and evaporative condensers. The Chemicator is a small, lightweight, closed reservoir, mounted on the side of the equipment. A portion of the recirculating water flows through it. On the upper portion of the Chemicator, a sleeve holds a weather-sealed plastic tube containing a sequence of variously formulated compressed chemical briquettes. As these are gravity-fed into water flowing through the reservoir, they dissolve and are carried into the entire system. *GEC-250*
Erlen Products Co.

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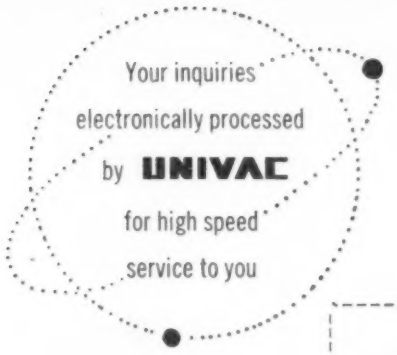

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19. Business computer

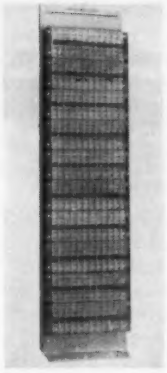
IBM has announced the fully transistorized 7080 data processing system, designed specifically for business. The large-scale system can produce management reports and process payrolls, inventory control, billing and similar accounting jobs up to 10 times faster and at a substantially lower job cost than that possible on the IBM 705 systems. In developing information, the new system can make 303,000 logical decisions a second. *GEC-600*
International Business Machines

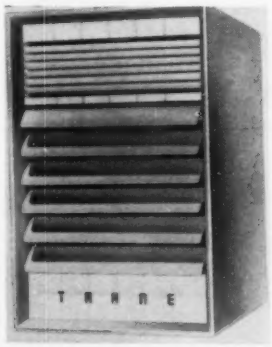
20. Gas refrigerators

Whirlpool is producing three new "no frost" gas refrigerator-freezers. All three of the 13-cu ft models eliminate the problem of frost accumulation in both freezer and food compartments. All have thin-wall urethane foam insulation, "million magnet" door gaskets for positive sealing, and squared-off styling. Top-of-the-line GA-1400 features the Jet Cold Shelf, a hollow glass shelf for quick chilling of desserts and beverages. *GEC-690*
Whirlpool Corp.

21. Multiplex-carrier system

General Electric has developed a transistorized multiplex-carrier system capable of handling up to 600 voice frequency channels on a single radio beam. Important to such users of microwave and cable systems as pipeliners and utilities, the single sideband suppressed carrier system has toll quality capable of meeting international and domestic long-distance standards. *GEC-140*
General Electric





22. Heater line

Trane has a new line of gas-fired heating equipment. Compact heaters are available in three types—propeller and blower unit heaters, and duct heaters—in a wide range of sizes. The heaters provide a quick, efficient source of heat for commercial establishments, factories, warehouses, and other areas. *GEC-410*
Trane Co.

23. Gas light

Model 700 has been added to Modern Home Products' line of Charmglow gas lamps. The new lamp is made entirely of aluminum. It comes complete with a bright eagle finial, mantle, burner, on-off valve, pressure regulator, and 8-ft post. *GEC-470*
Modern Home Products

TRADE LITERATURE

24. Mass flowmeter

Black, Sivalls & Bryson has introduced its mass flowmeter for natural gas in an 8-page bulletin (No. 16-210). The unit is manufactured and assembled by General Electric, with calibration, sales, and services by BS&B. It gives precise gas flow measurement directly in pounds, eliminating calculations for conversion of volume to weight. The flowmeter's use in lease applications, and by pipeline gathering systems, gas transmission systems, distribution systems, and large industrial consumers is discussed. *GEC-560*
Black, Sivalls & Bryson

25. Regulators

Reynolds Gas Regulator Co. has published a condensed catalog of its entire line of regulators. The 24-page booklet provides a brief but informative summary on Reynolds gas regulators—ranging from outdoor gas light and house service regulators to larger equipment, including pilot loaded, monitoring and district station regulators. *GEC-700*
Reynolds Gas Regulator Co.

26. Merchandising calendar

A new wall chart that moves the calendar 90 days ahead for retail appliance store merchandising and advertising planning has been printed by Norge. Easter is listed in January, Halloween in July, and Christmas in August. The wall chart also carries a monthly calendar which circles 64 other milestones. *GEC-550*
Norge Division

27. Automatic controls

Mercoid's 56-page catalog (No. 860) lists mercury switch-equipped controls for single-stage pressure, two-stage pressure, differential pressure, single-stage temperature, two-stage temperature, liquid level, and mechanical movement. Also illustrated are transformer-relays and a complete line of hermetically sealed mercury switches. *GEC-200*
Mercoid Corp.

28. Hydrocarbon recovery

Short-cycle adsorption-type hydrocarbon recovery units for moderate pressure gas systems are covered in a new brochure from Black, Sivalls & Bryson. The 8-page pamphlet explains the Dry Frac process in detail and displays 2-, 3-, and 4-tower systems. *GEC-300*
Black, Sivalls & Bryson

29. Sanitary clay

Oil Spunj is a specially processed sanitary mineral clay for absorbing oil and grease. It is processed in granular form. Spread on wood, metal, or concrete floors, it absorbs soluble oil, lubricating oil, grease, acids, and chemicals. *GEC-500*
Canfield Oil Co.

30. Industrial helps

Edmund Scientific Co.'s 128-page catalog is a handy guide and reference to equipment for industrial plants, research labs, product and design engineers, and others. Covered are essential items of production, laboratory and quality-control equipment; engineering and technical instruments, and mathematical and scientific books and training aids. *GEC-450*
Edmund Scientific Co.

31. Safety handbook

A comprehensive, 24-page safety handbook for industrial plants has been published by Bustin Steel. It covers a full line of safety gratings; stair treads ready made to fit most any size; stock lengths of safety edgings and step bars in various designs. *GEC-710*
Bustin Steel Products Co.

32. Tampers

A 3-color catalog folder features the new 1960 Jay tampers. Included are full specifications. The catalog defines the differences between the three Jay models in primary applications, plate sizes, tamping forces, travel speeds, and production. *GEC-210*
J. Leukart Machine Co.

33. Service performance

Proven cures for many major appliance service department problems are offered by Whirlpool Corp. in a new brochure titled "The 8E's for Service Performance." Presented in simple concise style, including liberal use of illustrations, the 23-page brochure describes every essential servicing requirement. *GEC-450*
Whirlpool Corp.

34. Industrial heating

Lennox Industries has published a manual on industrial direct-fired heaters. The 64-page book covers definitions of terms, complete explanation of direct-fired heaters, heat loss calculations, air distribution, single and multiple installations, etc. It also includes handy conversion tables for pressure, temperature, weights and measures. *GEC-410*
Lennox Industries Inc.

35. Ductile iron pipe

James B. Clow's new booklet, "Clow Ductile Iron Pipe and Fittings," is designed to solve pipe corrosion problems where piping is exposed to extreme chemical and acid conditions. Tables of physical and metallurgical properties of ductile iron pipe, corrosion resistance properties, and specifications are included. *GEC-620*
James B. Clow & Sons Inc.

vital narrows crossing *fully protected*

This underwater pipeline across New York Harbor "Narrows" will serve Brooklynites for many years, thanks to optimum corrosion protection applied by Hill-Hubbell.*

Underwater or underground, long, trouble-free service is assured if you specify Hill-Hubbell — the name synonymous with quality in mill coated-and-wrapped pipe.

*Pipe in photo weighted with concrete covering over Hill-Hubbell protection.

Specify Hill-Hubbell wrapped pipe on your next job . . .

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PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

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GAS MAIN STOPPER

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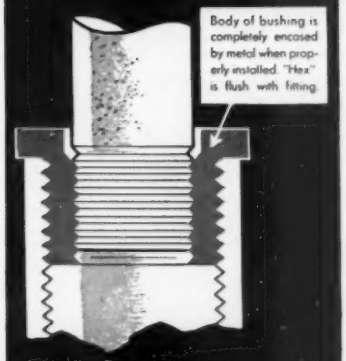
MAYCO

NYLON DIELECTRIC BUSHINGS



Stop Electrolysis!

■ Sandwiched between two dissimilar metals, Mayco nylon dielectric bushings prevent metal to metal contact – stop *electrolytic* action!

Able to withstand pressures in excess of 1000 lbs. and temperatures over 300°F, Mayco dielectric bushings gain added strength from clamping action of surrounding metal.

Most sizes also available with extra-heavy "Hex" to facilitate use of ordinary wrench.

Couplings and unions also available factory equipped with Mayco bushings.

Order Mayco Dielectric Bushings from your jobber or write to:

MAY PRODUCTS, INC.
BOX 427, GALESBURG, ILLINOIS

Manufacturers of: MAYCO dielectric fittings and MAYCO water softeners and filters

GAS ASSOCIATIONS

SGA plans close look at industry

The gas industry in the sixties is due for a thorough examination at the Southern Gas Association's 52nd annual convention in Galveston, April 25-27.

Some of the highlights of the program, announced by Ernest G. Hotze, SGA's general convention chairman, include:

A frank look at the gas appliance business and a comparison with its competition by top executives of three major appliance manufacturers—Judson S. Sayre, president of Norge Sales Corp.; Lee A. Brand, vice president of Empire Stove Co., and E. Carl Sorby, vice president of Geo. D. Roper Sales Corp.

Prospects of the gas industry will be discussed by a panel of editors—J. Fred Ebdon of *GAS;* Dean Hale of the *American Gas Journal;* Harold W. Springborn of *Gas Age;* and Melvin A. Judah of *Pipe Line Industry.*

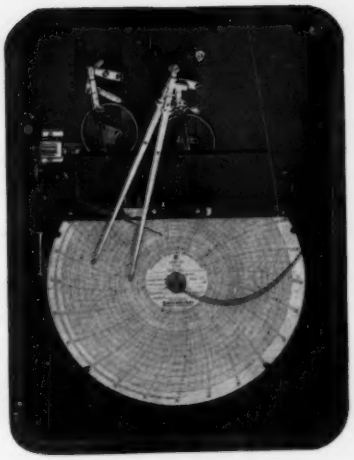
A distribution section panel will present proved practical methods of reducing operating costs. Participants: Louis B. Hulcy, Lone Star Gas; W. M. Nunn Sr., New Orleans Public Service Inc.; C. C. McEachern and Edwin D. Nuttall, United Gas Corp.; and W. C. Dahlman, Houston Natural Gas Corp.

An entire session on gas air conditioning will feature E. F. Davis, Chattanooga Gas Co., discussing sales methods and prospects; Charles A. Ashby Jr., Stone & Webster, discussing rates; Robert B. Smith, American Gas Association, presenting research developments; and C. W. Nessell, Minneapolis-Honeywell Regulator Co., speaking on efficiency.

Also on the program is a transmission section panel on automation, featuring William F. Haley of Westinghouse Air Brake Co., and H. O. Porter of Cities Service Gas Co.

Judd joins AGA

G. E. Judd has joined the American Gas Association's public information staff. He will serve as special feature writer.



AMERICAN® INTEGRATING ORIFICE METERS

American Integrating Orifice Meters provide more accurate measurement by the continuous multiplication of the square root of the measured differential by the square root of the absolute line pressure.

Single, double and duplex-integrating models available in a wide range of manometer types and working pressures. Dust-proof, die-cast aluminum cases... Gasclok and electric instrument chart drives. Also supplied with American Telecounter for remote readings.

Ask for Bulletin 401 for complete details.

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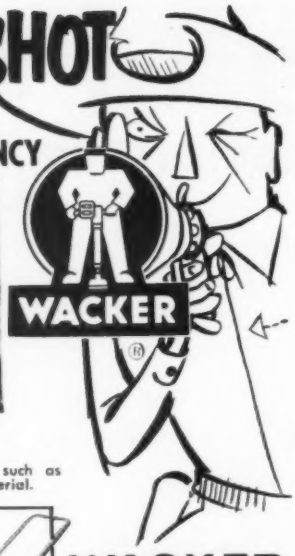
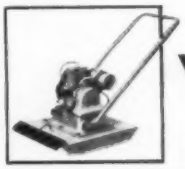
Sales Offices in Principal Cities

THE BIG SHOT
IN COMPACTION EFFICIENCY



MODEL GVR 100-C RAMMER
- 450 to 650 blows per minute.
- Lightweight — only 115 lbs.
- Compacts all types of material such as clay, earth or any granular material.

MODEL VPG 1500 VIBRO PLATE
- Develops 1700 lbs. — 5000 times per minute.
- Self propelled
- Lightweight — only 135 lbs. — 50% lighter than most vibratory compactors.



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Please send me free descriptive literature and the name of your nearest dealer. Dept. Gas 460.

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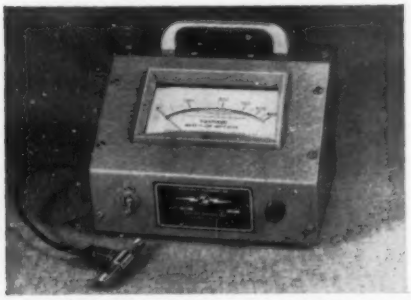
HASTINGS
MASS FLOWMETER
For Air and Gases

DIRECT READINGS INDEPENDENT OF PRESSURE AND TEMPERATURES

Calibrated directly in milligrams of air per minute. Especially well suited for measuring low rates of flow. Gives direct, continuous readings, holds calibration indefinitely, has low power requirements.



Hastings Model SM-1 Mass Flowmeter
Range: 0 - 500 milligrams of air per minute

HASTINGS MODEL SM-1 MASS FLOWMETER
Range: 0 - 500 milligrams of air per minute. Relatively linear scale. Large mirror scale assures highest accuracy and easier readability. Ideal for remote indicating recording.

HASTINGS MODEL MF-1 MASS FLOWMETER
Range: 0 - 10,000 milligrams of air per minute. Highest accuracy and sensitivity at low flow ranges. Maximum readability for air flows in range from 50 - 1,000 milligrams per minute.

COMPLETE LINE OF INDUSTRIAL, COMMERCIAL, AND LABORATORY INSTRUMENTS.
AIR METERS • JET VANES • WIND VELOCITY RECORDERS • AIR DRIFT INDICATORS
VACUUM AND PRESSURE GAUGES

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HAMPTON 64, VIRGINIA

Frank H. Trembly (right), director of sales for the Philadelphia Gas Works, receives achievement plaque for his pioneering work as first chairman of the National Television Committee of the Gas Industry. A. J. Wilmer, chairman of the Pennsylvania Gas Association's sales committee, made the presentation at the Annual PGA mid-winter sales conference.

Coleman heads Penna. Natural Gas Men's group

James E. Coleman, vice president-general manager of Manufacturers Light & Heat Co., Pittsburgh, is the new president of the Pennsylvania Natural Gas Men's Association. He succeeds D. B. Beecher, president of Equitable Gas Co., Pittsburgh.

Other new officers are: vice president, R. L. Ehrman, vice president of T. W. Phillips Gas & Oil Co., Butler, Pa.; and secretary-treasurer, P. L. Kesel, secretary-treasurer of Carnegie Natural Gas Co., Pittsburgh.

J. B. Sayers, chief counsel for Peoples Natural Gas Co., also of Pittsburgh, was elected a director.

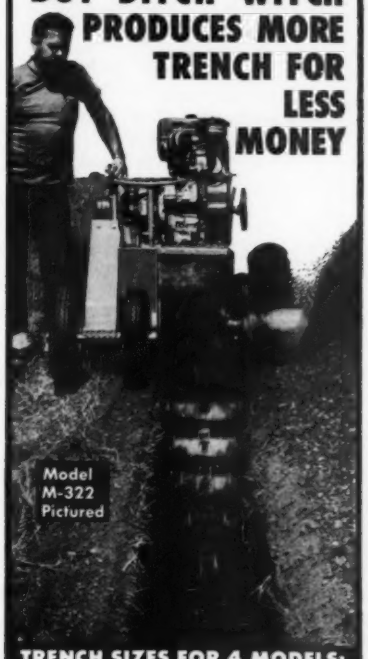
Industrial, commercial men to meet in Houston

"A Decade of Competition" is the theme of the 1960 AGA sales conference on industrial and commercial gas, scheduled for Houston's Shamrock Hilton hotel on April 5-7.

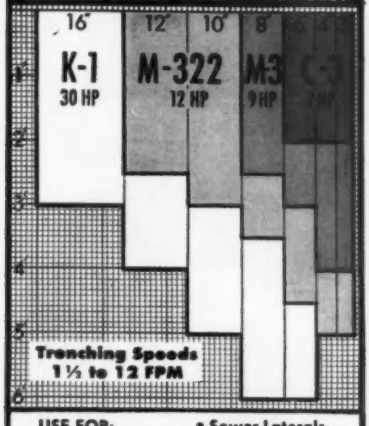
Following custom, the three-day conference will be divided into Industrial Gas Day on Tuesday; a general session on Wednesday when a formal luncheon, friendship room, and dinner will be held; and Commercial Gas Day on Thursday.

Speakers have been selected to convey the theme to sales executives, industrial gas engineers, commercial gas representatives, and manufacturers of industrial and commercial gas equipment.

"More or Less"
THE BEST
DITCH WITCH
TRENCHER
Other trenchers cost "More or Less"
Other trenchers dig "More or Less"
BUT DITCH WITCH PRODUCES MORE TRENCH FOR LESS MONEY



TRENCH SIZES FOR 4 MODELS:



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Pipeline conference planned by API

The API's Division of Transportation will hold its annual pipeline conference in Tulsa, April 28-29. Meeting place is the Mayo hotel.

Topics of papers to be presented include the future of pipe-lining, right-of-way problems, public relations, transient pressures in long pipelines, automation and instrumentation, offshore installations and marine terminals, and dispatching and scheduling.

A two-part panel on automation will be presented on the afternoon of the second day.

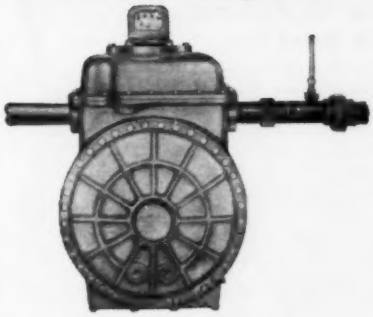
PGA's production group plans April meeting

Pennsylvania Gas Association's production committee has scheduled its meeting for April 21, according to Chairman Joseph M. Barnes Jr., plant superintendent of Philadelphia Electric Co. The one-day meeting will be held at the Drexelbrook Swimming & Tennis Club in Drexel Hill, Pa.

Speakers and their subjects include: Clarence B. Glover, United Engineers & Constructors, "Our Latest Experience in the Production of Thermal Oil Gas"; Warren Powell, Philadelphia Gas Works, "Protective Paints and Coatings"; Stone & Webster Inc., "Emergency Gas Pooling in New England"; Dr. Martin A. Elliott, director, Institute of Gas Technology, "The Role of Gas in Meeting Future Energy Demands"; and Herbert F. Jewson, Philadelphia Electric Co., "Liquefied Petroleum Underground Storage."

Included in the program is a trip to Sun Oil Co.'s Marcus Hook, Pa., plant. High spot of the trip will be a look into one of the underground propane storage caverns being mined by Fenix & Scisson Inc.

new
AMERICAN®
1000 psi
working pressure
critical flow prover



Designed for 1000 psi maximum working pressure, the new American® Critical Flow Prover provides economical proof testing of high pressure displacement meters in the field. The portable, precision-engineered design meets the highest standards of accuracy and dependability.

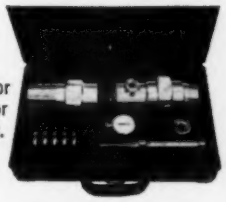
Available in 2-inch size with gas capacities from 250 to 6000 cfh. Each orifice individually calibrated.

SAVES MONEY
no costly set and removal expenses.

SAVES TIME
proof tests conducted on-the-spot.

SAVES EFFORT
no handling or transporting meters to the shop.

ASK
your American representative for Bulletin 203.1 for complete details.



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PIPE-WRAP TAPE

Positive Protection for Buried Pipe

Here's pipe protection by the roll. Pipe-Wrap is made of stretchy, inert polyethylene with a pressure-sensitive adhesive to provide a tough, continuous barrier against rust, acids, alkalis and electrolytic currents. Saves time and money.

MANUFACTURERS AGENTS WANTED FOR SOME SELECTED AREAS

SEND FOR FREE SAMPLE

Arno® ADHESIVE TAPES, INC.

Dr. Scholl's Adhesive Tape Division

4156 Ohio Street, Michigan City, Indiana

regulatory • *Cont'd.*

from page 12

state natural gas pipeline companies to interconnect their facilities with others engaged in the sale and distribution of natural gas and to sell or exchange gas with such persons, together with authority to prescribe the terms, arrangements, and conditions for such interconnections and the compensation payable for them.

Voluntary interconnections.—That a new subsection be added to section 7 of the Natural Gas Act permitting voluntary interconnections of the facilities of interstate natural gas pipeline companies and their maintenance on a permanent basis for emergency use upon authorization by the commission, and, under such circumstances, conferring a jurisdictional exemption.

Comprehensive investigatory authority.—That section 14(a) of the Natural Gas Act be amended so as to give to the commission broad investigatory powers with respect to the gas industry.

Additional authority as to the

Use the Heath "V" Type Survey to locate leakage

in your residential and rural areas. This Vegetation and Soil Survey gives you maximum SAFETY, plus a 3rd party Audit of your system.

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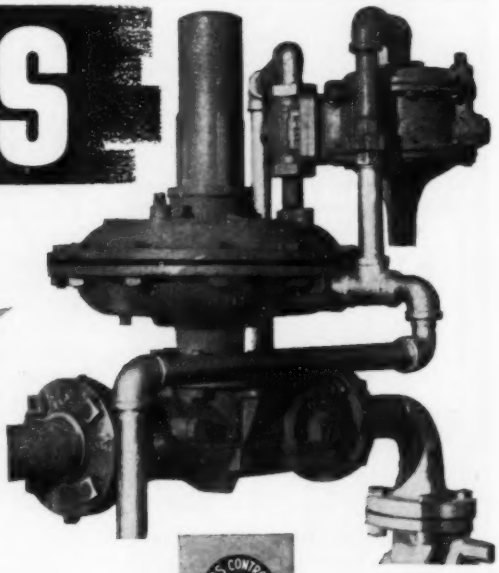
...for Peak Performance

REYNOLDS **PL** series...



SENSITIVE, AUTOMATIC CONTROL FOR MORE CAPACITY ON LARGE GAS LOADS: Reynolds PL Series Gas Regulators are designed for any type of gas regulation requiring accurate outlet pressure conditions with normal capacities greater than 5,000 cu. ft./hr. Even regulation improves meter accuracy.

FOUR MODELS, Screw or Flange. Psi to Psi or Psi to oz. regulation. Reynolds PLP Series Pilots are designed for easy field maintenance.

GAS CONTROL SINCE 1892

If It's a Reynolds Gas Regulator, It's RIGHT for the Job

REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA

A SUBSIDIARY OF ARKANSAS LOUISIANA GAS COMPANY

importation and exportation of natural gas.—That sections 1(b) and (2) of the Natural Gas Act be amended so as to include foreign commerce within the coverage of the act and define persons engaged in the importation and exportation of natural gas as "natural gas companies" so far as their operations in the United States are concerned.

Alienation of gas reserves.—That section 7(b) of the Natural Gas Act be amended to require commission approval for the transfer by an interstate natural gas pipeline company of natural gas reserves where such reserves have constituted part of the bases for issuance of certificates of public convenience and necessity.

Delegation of commission functions under Natural Gas Act.—That Natural Gas Act be amended to give to the commission authority to delegate to one or more commissioners or subordinates any portion of its work, business, or functions now requiring commission action under that Act.

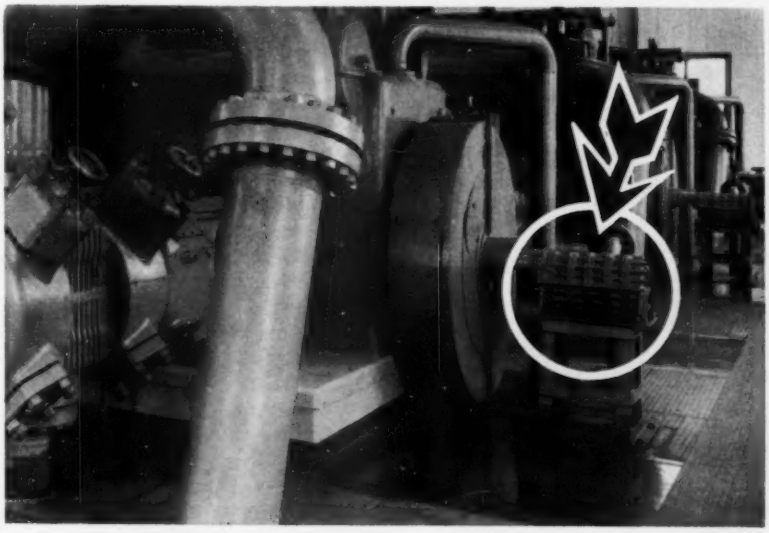
Administrative procedures in Federal regulatory agencies.—There are now pending in the Congress several bills whose broad objectives are to improve the administrative process. The general objectives may be desirable and some of the specific provisions have merit. In the opinion of the Federal Power Commission, however, many particulars of the bills, if adopted, would tend to defeat important objectives and purposes as set out in the statutes administered by FPC. The commission takes the view that existing law and procedures under the Natural Gas Act and the Administrative Procedure Act provide a wholly adequate framework with certain specific modifications within which to carry out its duties effectively, expeditiously, impartially, and with the least impingement on private rights necessary to further the public interest. Improvements, says the commission, can best be achieved by more effective adoption of the existing framework and modes of proceeding as experience indicates, with modifications in certain statutory and administrative particulars to meet specific objectionable or dilatory situations. ■

corrosion • *Continued from page 18*

Suspend a specimen of coal tar enamel in one beaker or mason jar, and Gulf States # 434 pipe enamel in the other. The brand or type of coal tar enamel to be used in the test is left to your choice.

Suspend these respective specimens in separate mason jars, after filling with water, either distilled or tap. Bring up both jars to between 140-160 deg F. At this suggested temperature, the regular coal tar enamel would have a tendency to flow and it perhaps would be better to use either plasticized or semi-plasticized of any recognized brand.

Next, we suggest that you observe these specimens daily, noting particularly the color of water and any affluent which might be coming from the specimens themselves. In a matter of a few days, you will find that the water in which the coal tar specimen is suspended will be becoming bluish in cast, and somewhat hazy and—ulti-



Berry Hydraulic Fan Drives used in remote control compressor station

The Texas Eastern Transmission Corporation compressor station at Linden, N. J., is controlled by an operator 40 miles away. This main line station has 2050 BHP Clark turbo-charged, gas-engine-driven compressors.

A Berry Hydraulic Pump is directly connected to the crankshaft of each engine and supplies fluid power to drive its related aerial cooler fan. Each fan is directly mounted on the shaft of a Berry Hydraulic Motor. This unitization helps maintain constant jacket water temperature automatically, regardless of engine loading, ambient temperature, etc., by a control in the hydraulic system.

NOW . . . 21 internal gear ratios

To reduce installation costs Berry now offers 21 internal gear ratios. This permits direct connection of hydraulic pumps at prime mover speeds from 250 RPM to 1750 RPM. Hydraulic motors may be direct connected to fans, water pumps, etc., from 100 to 2000 RPM.

Berry HYDRAULICS
A DIVISION OF THE OLIVER TYRONE CORPORATION

General Sales Office:
Oliver Building, Pittsburgh 22, Pa.
Southern Sales Office and Plant:
Corinth 1, Miss.

MAIL FOR FAN DRIVE DATA
BERRY HYDRAULICS
2229 Oliver Building, Pittsburgh 22, Pa.
Please send data on Berry Hydraulic Fan Drives to:

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Company _____
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How these gauges guard your demand metered services

Many gas utilities have established penalty rates for gas used during peak periods. Accurate records are needed to prove these demands—also to show areas where excessive usage is causing pressure deficiencies.

The two Rockwell gauges pictured below provide inked records which verify use and furnish both volume and pressure data. For additional information write: Rockwell Manufacturing Company, Dept. 60 D, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

ROCKWELL TYPE "T" EMCORECTOR—chart is clock driven. One pen traces an accurate record of pressure against time. A second pen records volume in units of either 1,000 or 10,000 cu ft. Two straight reading indexes are provided—one for actual displaced measurement while the other automatically corrects this to base pressure volume.

ROCKWELL COMBINED RECORD GAUGE. Has clock driven chart on which two pens trace (1) gas usage in units of either 1,000 or 10,000 cu ft and (2) gas pressures. These increments can be calculated, if desired, to correct to base pressure volume.

VOLUME AND PRESSURE GAUGES
another fine product by
ROCKWELL

mately—a ring of straw colored oily material may be evidenced at the water line, or just above. When the specimen is taken from the hot plate and cooled, the oily phase of the coal tar specimen may be deposited slightly above the water line after the water has cooled and contracted. The water, too, will very probably take on a yellowish-brown cast as well as the original bluish haze, although these colors will vary. But in any event, you probably will find a considerable clouding of the water. This is true in our experience only of the coal tar specimen.

The only reason for carrying the jars under heat is to accelerate the test. It would come out practically the same way if held over a matter of years in water at normal temperatures. This has been evidenced in samples which have been maintained for years; all the coal tar samples which we have been able to examine evidenced a discoloration much more severe than that which will be shown in our suggested seven-day test.

Contrastingly, the Gulf States #434 sample will not have discolored the water in any manner. Visually, the water is as pure and as clear as originally.

Make your own evaluation of the significance of this test. Our consultants advise that this is evidence of solubility and non-solubility.

Gulf States Asphalt Co. has, for some time now, been conducting a series of tests on underground pipelines coated with GS 434. Prominent corrosion specialists have been retained by us to seek out and determine the facts as revealed by performance of our pipe enamel in all areas of the country. Nothing will be withheld and these reports, when published, will have a great deal of interest to all people interested in securing enduring protection to buried pipelines.

Asphalt is, quite accurately, called an "economy" coating. A high-performance asphalt enamel is economical, in original cost, in maintenance costs, in the greater longevity it provides. The simple test described herein may initiate a train of thought the end result of which may be to replace misinformation and inaccuracies with fact. We genuinely hope that you will conduct the test for yourself. ■

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the Concentrated Fuel
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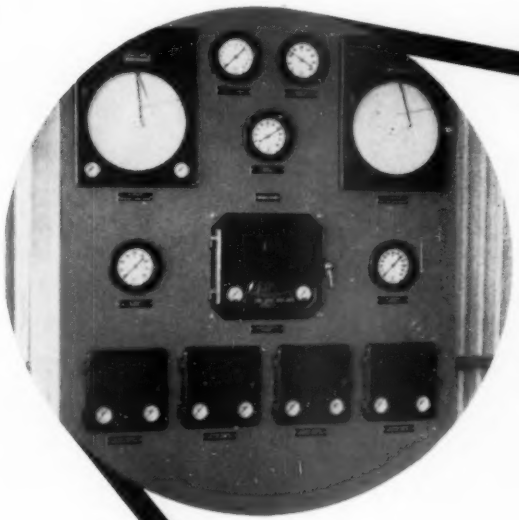
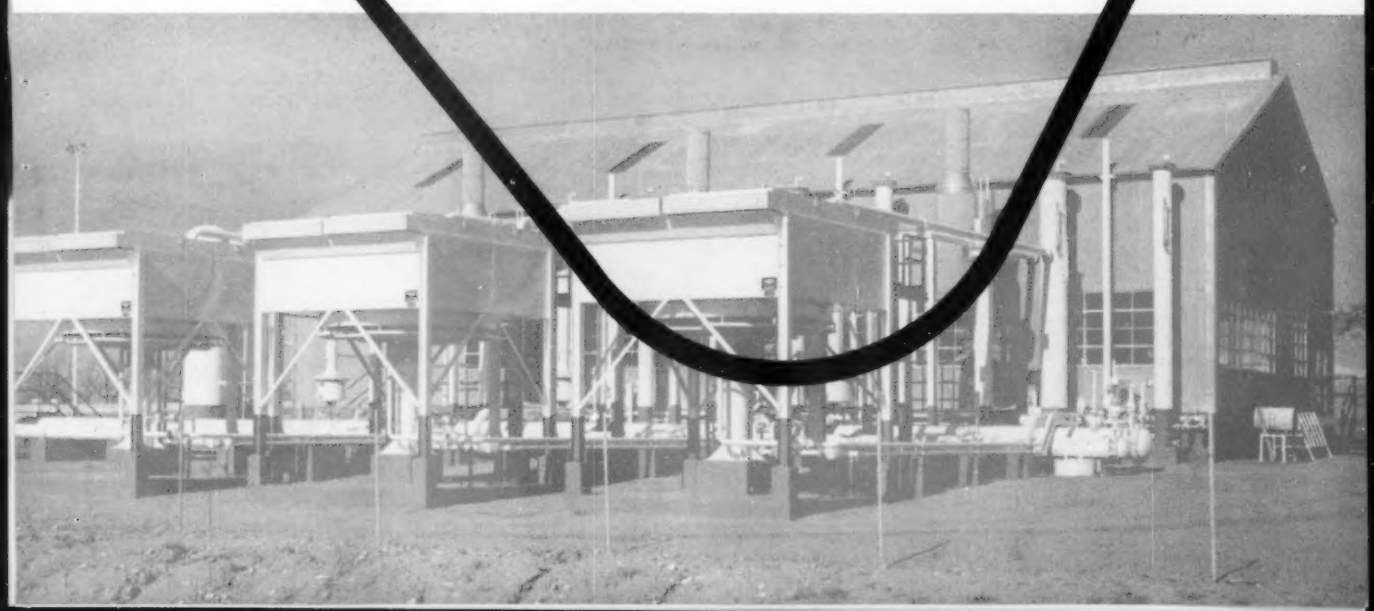
GAS

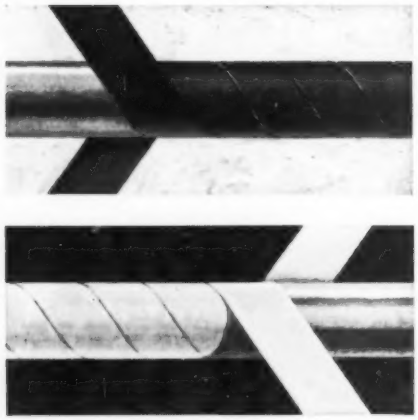
PIPELINE SECTION

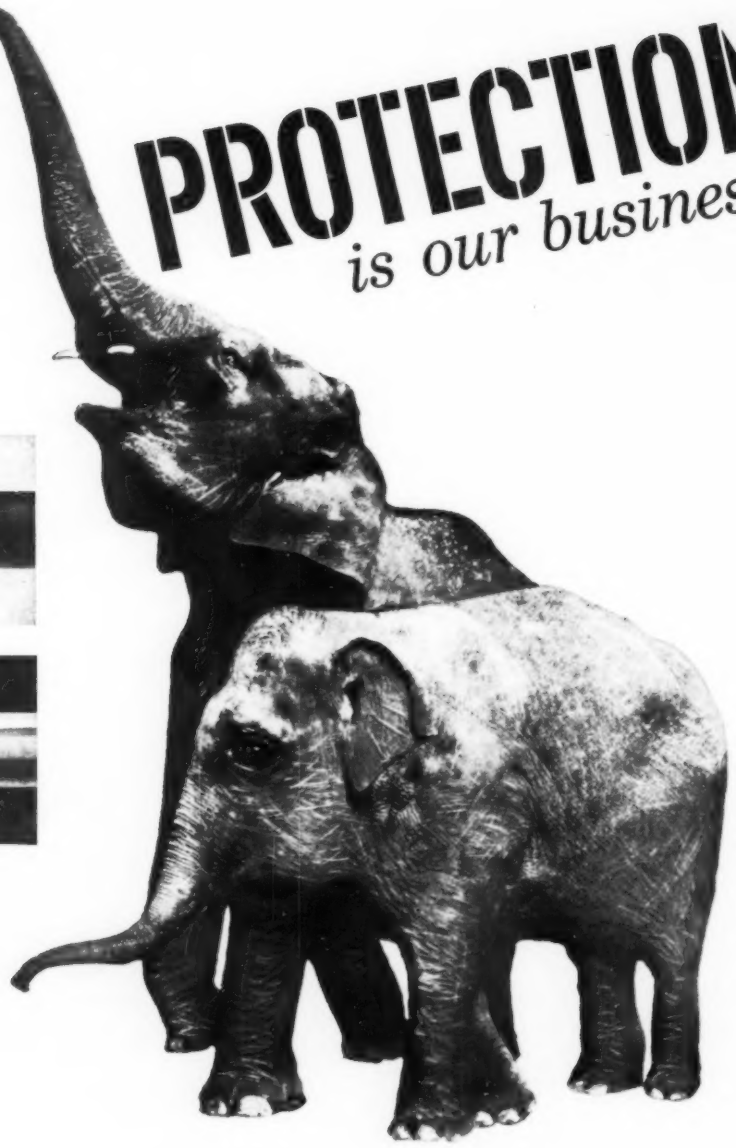


Pneumatic control of a semi-attended field station



PROTECTION
is our business





The finest protection that nature and science, working together, can provide for your pipe lines is found in Nicolet Asbestos Pipe Line Felts.

From Nicolet's mines, through quality controled manufacture, to final shipment for mill wrap or over-the-ditch application, every step is calculated to give you the best in quality, performance and economy.

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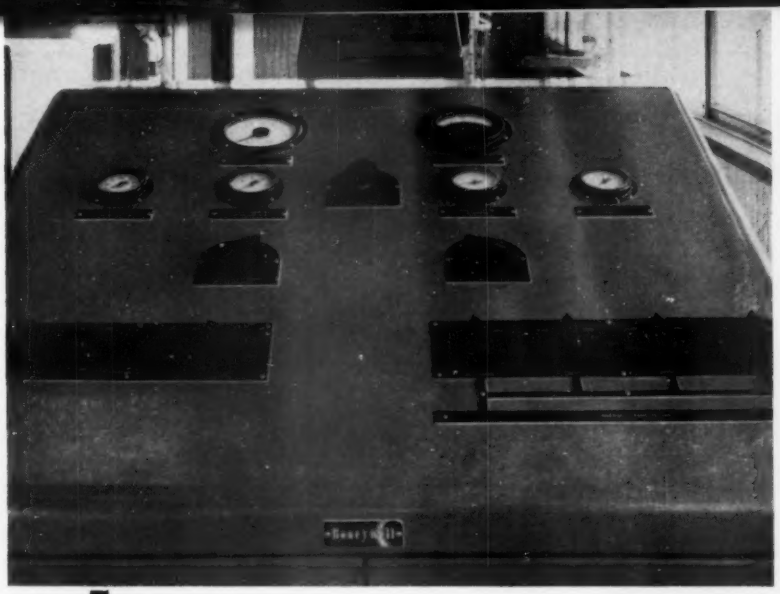
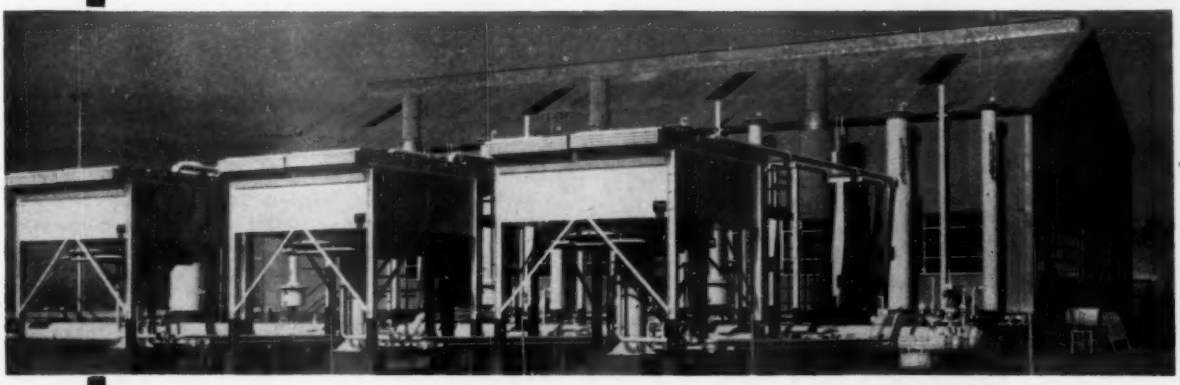


Pneumatic control systems for semi-attended field stations

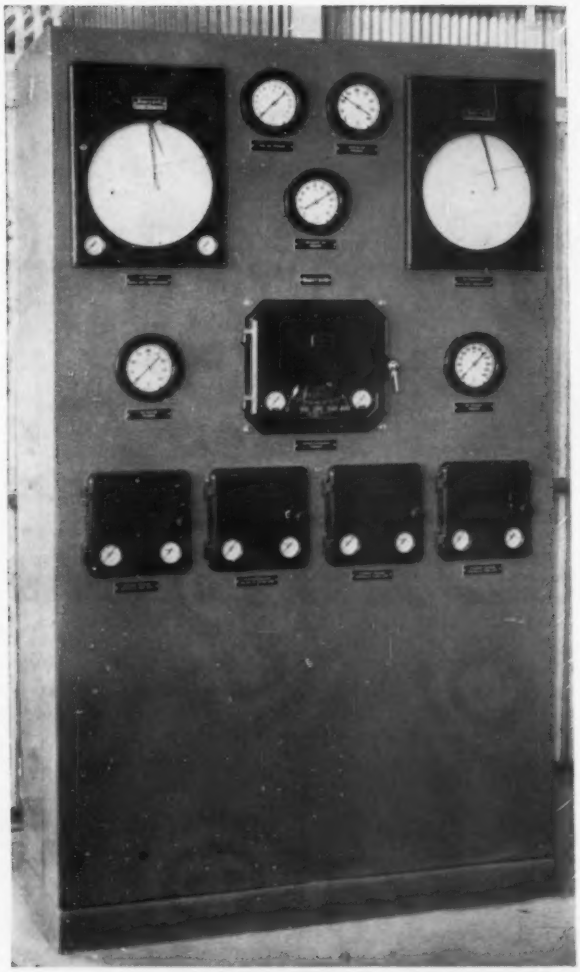


By IVAN SCHMITT, Engineering Department • El Paso (Texas) Natural Gas Co.

EL PASO NATURAL GAS CO.'s Panoma No. 2 compressor station is a small field installation located in the Panhandle area of Texas. It was designed to deliver 50 MMcfd from the 200 psi gathering system to the original Panoma station located 26 pipeline miles downstream. Compression equipment consists of three 660-hp Ingersoll-Rand 12-SVG, single-stage reciprocating compressors. Panoma No. 2 is semi-attended in that its operation is dependent upon periodic visits of operating personnel. No remote control or telemetering facilities have been provided.

The station is operated by personnel dispatched from Panoma, or by switchers dispatched from the field by radio. Therefore, consideration has been given to making the station "easy" to operate during the attended period of its operation, as well as adequately protecting and loading the equipment while operating unattended. The engine control system lacks some of the "control finery" of the present day fully automatic mainline station; however, it does permit convenient one-man operation of the compressor units.

Photo at top shows sloping control and instrument surface of engine console. Bottom row of controls starts and loads engine manually. The two controls immediately above bottom row start and load the engine automatically. The lower photo is an overall view of Panoma No. 2 compressor station.



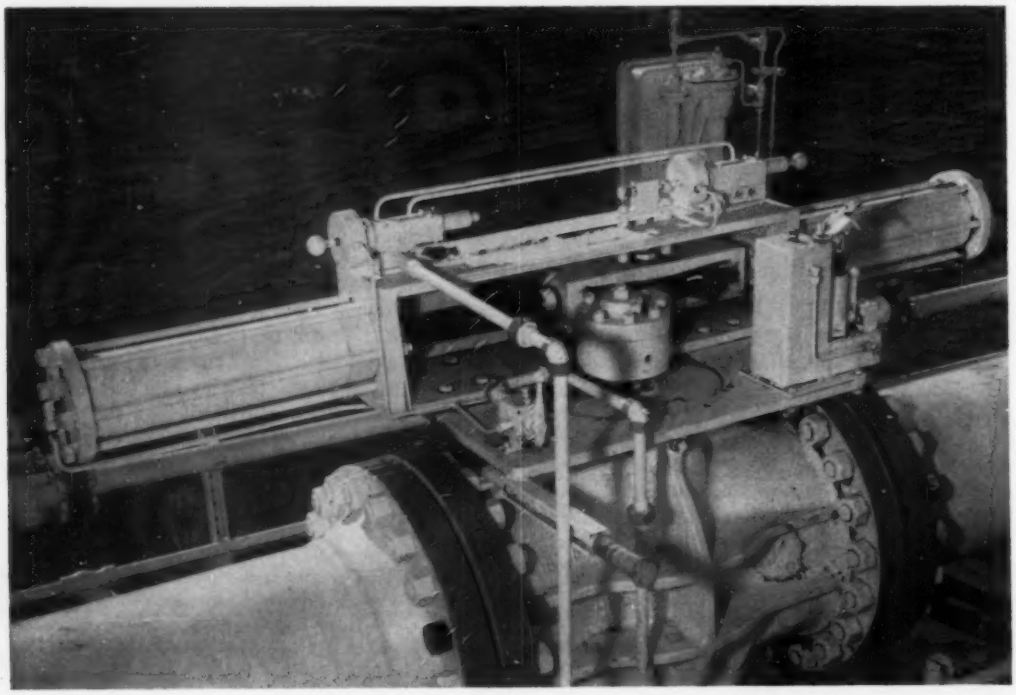
• Station arrangement

The three Ingersoll-Rand compressors are installed on a unitized basis which lends itself well to semi-attended operation. The engine cooling water system utilizes one engine-driven pump to furnish both jacket and oil cooling water. This is accomplished by operating a high water capacity oil cooler in series with the engine jackets. The pump discharge of 236 gpm of 150 deg F water is piped directly to the oil cooler mounted above the crosshead housings. After passing through the oil cooler with a 1 deg temperature rise, the water passes directly into the engine jackets where it exits at 167 deg F. Oil temperature is maintained at 165 deg F out of the engine. A thermostatically controlled three-way valve maintains the incoming water at 150 deg F and provides for a quick warm-up of the engine in cold weather.

The water and gas cooling fin-tube sections for one engine are mounted in the same structure and are served by a common hydraulic motor-driven propeller-type fan of fixed pitch. Economic studies indicated the engine-driven hydraulic system could be operated slightly cheaper than electric motor driven fans.

Commercial electrical power is available, but without the reliability needed for continuous station op-

At left is the station instrument and compressor loading panel. Instrumentation on lower half of panel maintains rated load on all engines by operating pneumatic pockets in accordance with suction and discharge pressures. BELOW: Station discharge valve operator showing the combination air- and cam-operated pilot valves located on top of the operator.



eration. The installation of engine-driven generators would have increased considerably the initial cost of the station, as well as the amount of operating attention required. For this reason, the station and compressor controls are primarily pneumatic. Purchased electric power is used for lights and intermittent requirements such as operating the motor-driven starting air and instrument air compressors and regenerating the instrument air dryer.

A non-lubricated instrument air compressor supplies oil free air for the 60 psi instrument air system. Downstream of the storage tank the air is filtered and passed through a desiccant type dryer before entering the instrument air header. The dual bed dryer automatically switches beds according to a predetermined cycle and regenerates the bed not in service. A make-up system furnishes air from the starting air tank in the event of an instrument air compressor failure.

• Compressor controls

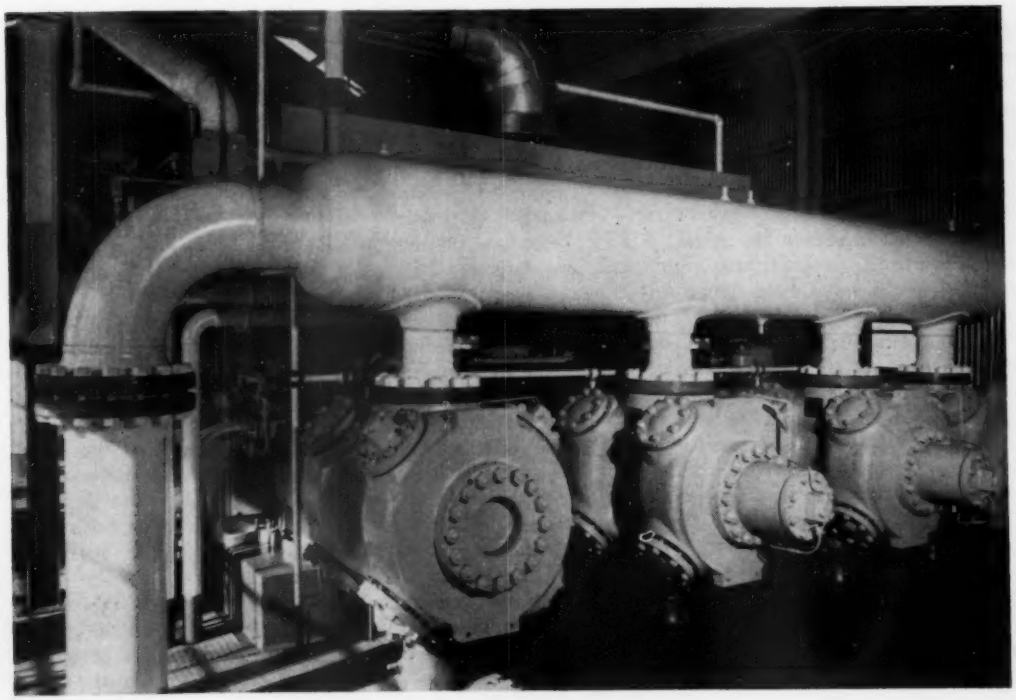
The engine control consoles contain all the necessary controls and instrumentation for automatically starting and loading the Ingersoll-Rand 12-SVG compressor units. A manual option for starting and loading the unit is also provided.

Both the automatic and manual controls are pneumatic and operate on 30 psi. However, the operating pressures may be raised to 60 psi if necessary to increase the speed of response and provide crisp, positive operation of all controls. Timing and programming circuits operate on 15-psi pressure.

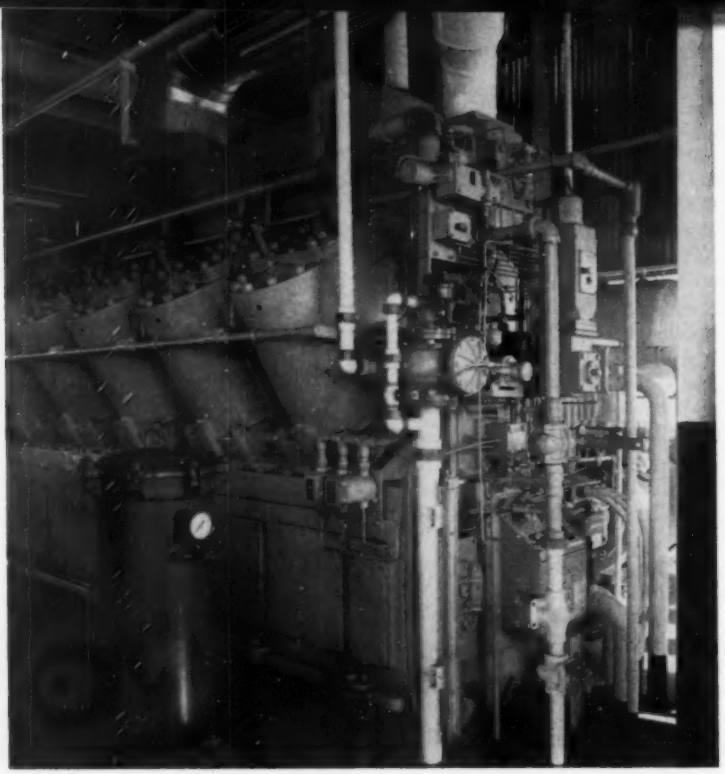
All pneumatic leads within the console terminate at connector blocks near the bottom of the console. The leads are marked at the connector blocks with nomenclature descriptive of their operation in the circuit, which aids in trouble shooting. All pneumatic leads on the engine and unit valve operators are also brought to similarly marked connector blocks. Interconnecting leads are Crescent armored multitube bundles. Careful layout of the control system reduced field installation to a simple matter of connecting the tubing bundles to identically marked connector blocks located on the console, engine and valve operators.

The following instruments and controls are functionally arranged on the sloping console front:

- Engine rpm indicator
- Exhaust pyrometer
- Starting air pressure gauge
- Suction pressure controller air to governor gauge
- Manual air to governor gauge
- Engine oil pressure gauge
- Manual engine speed control
- Automatic-manual starting sequence control
- Automatic stop-start control
- Manual oil pump control
- Manual starting air control
- Manual fuel and ignition control
- Manual discharge valve control
- Manual vent valve control
- Manual by-pass valve control
- Manual suction valve control



Compressor cylinder arrangement showing pneumatic pockets on the two center cylinders and pneumatic valve lifters on the end cylinders.



Operating end of one of the compressor units.

When the "automatic-manual sequence control" is in the "automatic" position, the unit may be started by turning the "automatic start-stop control" to "start." The following operations then occur: A pneumatic signal checks the position of each of the unit gas valves. If the suction and discharge valves are closed and the vent by-pass valves are open, the engine starting sequence is allowed to proceed and the air motor driven pre-lube pump starts. After a 20-second time delay, the starting air valve opens and the low lube oil pressure shutdown is overridden until the engine fires. After a cranking interval of 6 seconds the ignition is turned on, the fuel valve opens, and the engine safety controls are energized. As the engine fires and comes up to idle speed, the increase in oil pressure shuts off the starting air and pre-lube pump and releases the override on the engine safety controls. The engine is now running at idle speed. If for some reason the engine did not come up to speed within a specified time interval, the starting sequence would have been stopped by the incomplete starting sequence shutdown.

If the engine has been running and is warm, loading will proceed after a short time delay which allows the engine to smooth out. If the engine is cold, loading will not proceed until the jacket water is warmed up. When these two conditions are fulfilled, the discharge valve starts to open. As the discharge valve begins to admit gas to the cylinders the vent valve starts to close. The length of purge time is controlled by the speed of closure of the vent valve. As the vent valve nears the closed position, it initiates the opening of the suction valve. Partial opening of the suction valve initiates closure of the by-pass. When the by-pass reaches the full closed position, the incomplete loading sequence shutdown is overridden and the engine is switched to station suction pressure speed control.

When the "automatic start-stop control" is turned to "stop," the fuel valve is closed and the magnetos are grounded. All gas valve operators start their shutdown sequence simultaneously; however, their speed of operation is adjusted so that the suction and discharge valves close before the vent opens. The by-pass valve is also timed to open after the closing of the suction and discharge valves.

When the "automatic-manual sequence control" is in the "manual" position, the engine may be manually started and loaded from the console by operating each of the individual controls which admits air directly to the starting air valve diaphragm, fuel valve diaphragm, etc. Adequate lockout of the automatic circuitry when operating manually is accomplished by venting the air supply to the automatic circuits. All engine safety controls are energized as soon as the engine fires and remain in operation as long as the engine is running.

The unit valve operators are Ledeen tandem cylinder operators mounted on Nordstrom plug valves using discharge pressure gas as a source of power. The basic operator as discussed in detail under the emergency shutdown system is used with control modifications to perform the necessary function of the loading circuit. In addition to the two "normally closed" Fluid Span pilot valves, a pneumatic position check valve for detecting proper gas valve position prior to starting the engine and a pneumatic programming valve which initiates the next operation in the loading sequence are mounted on the valve operator body. Both the position check valve and programming valve are cam operated from the piston rod; however, the cam which operates the programming valve is adjustable with respect to the plug

valve so that proper "timing" of the loading sequence is easily accomplished. The four pneumatic valves and cam assembly are housed within an enclosure which protects them from winter icing.

Each engine is equipped with the following safety controls which initiate a shutdown of the unit when a malfunction occurs:

Low lube oil pressure
High jacket water temperature
Engine overspeed

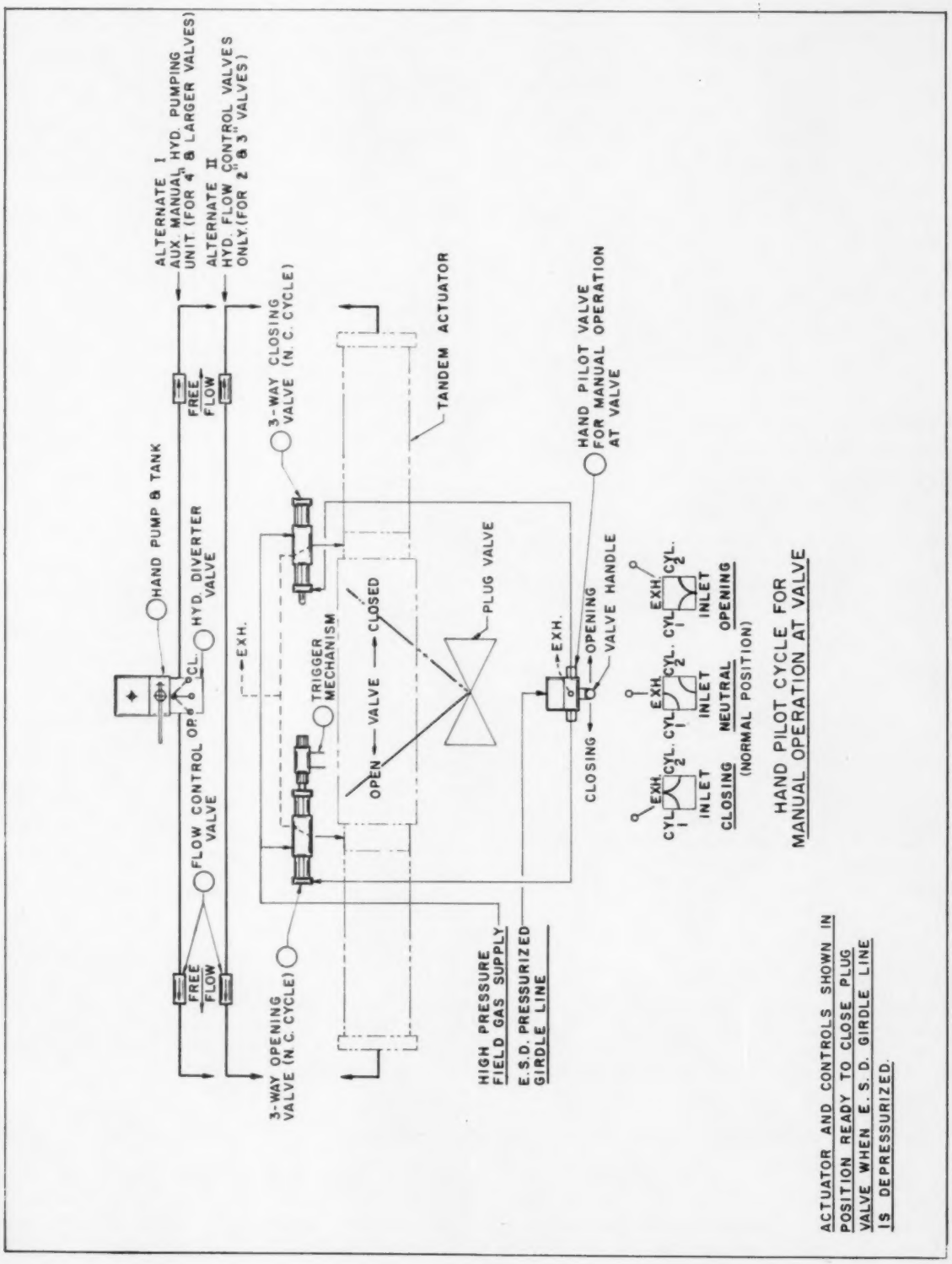


Fig. 1. Typical station valve operator schematic.

High discharge gas pressure on each compressor cylinder
Scrubber high liquid level
High discharge gas pressure

In addition to these unit shutdowns, all engines shut down on low plant suction pressure and station emergency shutdown. When operating automatically, a safety control shutdown will kill the engine by closing the fuel valve and grounding the magnetos and initiate the unloading and venting of the compressor cylinders. When operating manually, a safety control shutdown kills the engine as during automatic operation but does not depressurize the compressor cylinders.

• Station instrument panel

The station instruments and compressor loading system have been incorporated in one panel to conserve floor space and reduce panel costs. The panel contains plant suction and discharge pressure and temperature recorders, as well as suction, discharge, instrument air, starting air, and fuel gas pressure gauges. No electrical power is required by the station instrumentation.

• Compressor loading system

The compressor loading system incorporated in the lower portion of the station panel operates the pneumatic pockets and valve lifters on all engines. Rated load is maintained on the engines by sensing both station discharge pressure and station differential pressure and controlling the pockets and valve lifters in accordance with preset pressure combinations. The heart of the loading system is a pneumatic differential controller whose 3-15 psi output varies as the station differential, and four pneumatic snap acting controllers which trip at various discharge pressures. The 3-15 psi output of the differential controller operates the diaphragms on a group of snap acting valves which control four steps of loading based on compressor differential pressure. The four discharge pressure controllers provide four steps of unloading based on discharge pressure. With both the differential pressure and discharge pressure steps integrated together 16 pressure ranges are covered by the loading system. Identical 20-psi signals are transmitted to each engine console where they operate three-way valves which control the 100 psi air to the cylinder actuators.

• Emergency shutdown system

The emergency shutdown system is a normally pressurized pneumatic system operating at 60 psi. Actuation of the system is accomplished by tripping a three-way valve at either of two locations which vents pressure from the system. The first "emergency shutdown station," located just outside the compressor building, shuts down the compressors and closes the station suction and discharge valves. The second "emergency shutdown station," located in the plant yard, performs all the functions of the first station, in addition to killing all electrical power in the compressor building and opening the vent valve on the plant piping, thereby venting all gas from the compressor area. Venting of both the suction and discharge piping through one vent valve in the discharge piping is accomplished by a check valve between the suction and discharge piping which permits suction gas to flow into the discharge and out the vent valve.

The station gas valves operated by the emergency shutdown system are also equipped with Ledeen valve operators and utilize pipeline gas pressure as the motive force for valve operation. A volume tank floating on the pipeline with a check valve at the inlet insures sufficient gas for two operations on all ESD operated valves in the event of a loss of pipeline pressure near the compressor station. A small air tank similarly arranged always insures an adequate air supply for the pneumatic portion of the ESD system.

Discharge pressure gas is admitted into the valve operator cylinders by one "normally open" and one "normally closed" Fluid Span combination air and cam operated pilot valves (see *Fig. 1*). Air pressure from the ESD system acts on a Bellofram actuator to shift the Fluid Span valve into the pressurizing position. As the valve operator nears the end of its stroke, a cam attached to the piston rod engages the opposite end of the Fluid Span valve and, overcoming the force of the Bellofram actuator, shifts the Fluid Span valve into the vent position, thereby automatically venting the gas from the cylinder. Tests performed on the Fluid Span valve before placing it in service indicated that it would operate on relatively dirty, high pressure gas while requiring a very low shifting force and remaining essentially bubble tight. Valve operator dependability has markedly increased where the Fluid Span pilot valve has replaced the conventional valve operator pilot assembly.

The station valve operators may be manually operated locally by a three-position, hand-operated valve. This valve is spring returned to its center or neutral position and must be hand-held in the "opening" or "closing" positions. This feature permits the ESD system to be repressurized after a shutdown without causing an automatic operation of the ESD operated gas valves. The porting of the hand operated valve is so arranged that the valve operator will go to the shutdown position and remain there when the ESD system is depressurized, even if the hand-operated valve is inadvertently shifted to its other positions.

The operator's closed hydraulic circuit, which is filled with a relatively constant viscosity Mil Spec 5606 oil, provides "chatter free" valve operation. Two back-to-back speed control valves consisting of a small check valve and adjustable restrictions are contained within the hydraulic circuit and provide independent control of valve operator speed in either the opening or closing direction. Manual operation of the valve operator when no gas pressure is available is made possible by a hand pump located in the hydraulic circuit of the operator on 4-in. and larger valves.

Operation of the control system during the plant start-up and checkout was very successful. Careful component selection and system design with particular emphasis on a quality air supply is expected to provide good system dependability and low maintenance operation. ■

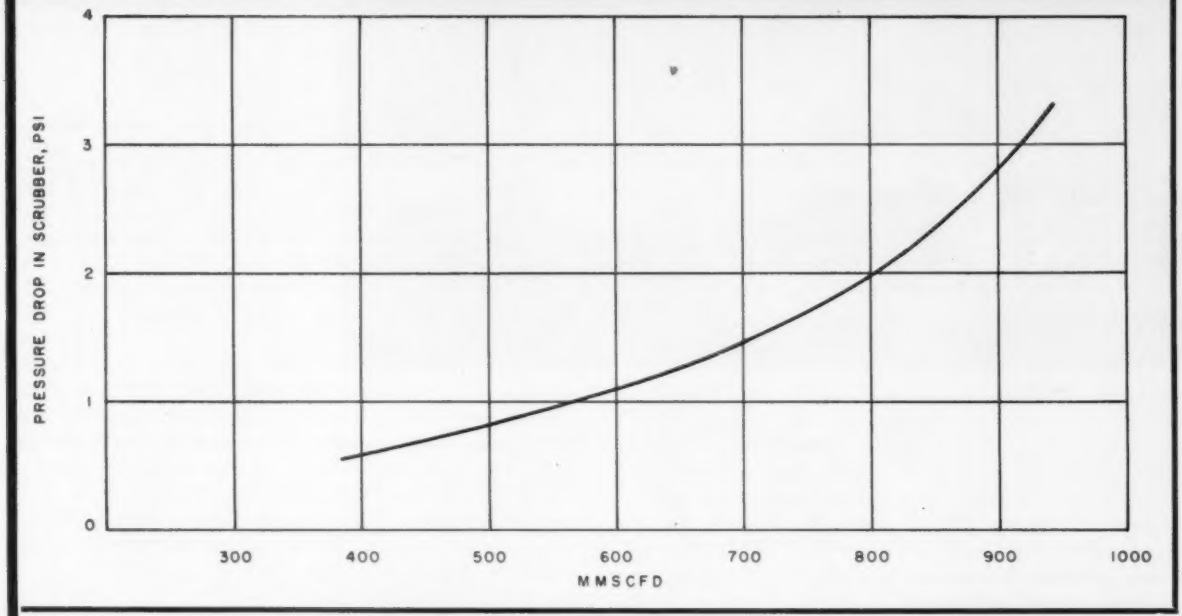


Chart of pressure drop through line purifiers—either make—at Q ranging from initial 400 MMcf to ultimate doubling of throughput. The design maximum of 2 lb is reached at 800 MMcfd.

Scrubber selection for gas lines

By ELTON STERRETT
Mechanical Engineer, Houston

PERHAPS most applicable to the natural gas pipeline is the descriptive adjective "expansive," which Mr. Webster's successors define as "tending to expand, capable of expanding." For among all pipelines the natural gas trunkline is the one most in a state of flux. The original project is no sooner completed (?) and gas deliveries started than the engineering staff is put to the task of devising most advantageous means for obtaining greater throughput.

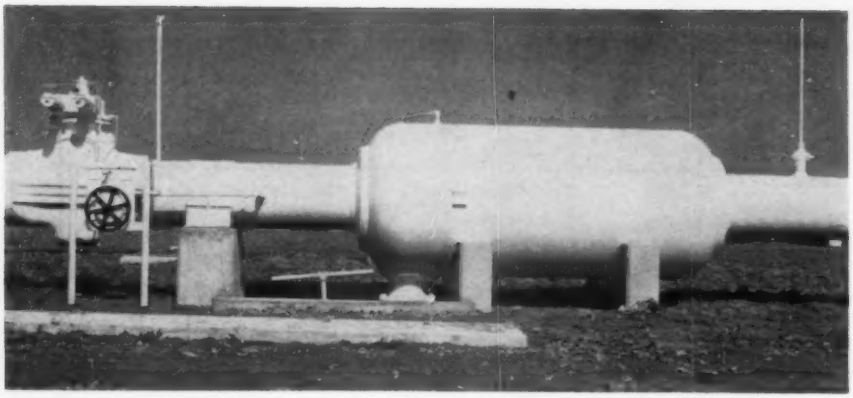
Since the addition of more compressor horsepower to existing stations is expensive and will, in a well-designed system, introduce uneconomic compression ratios, the engineers' first choice is partial looping of the mainline.

By looping, the compression ratio is decreased, in that a higher suction pressure is successively available to each station down the line. By raising the suction pressure, while holding the discharge constant at the original design maximum, a given horsepower obviously can compress a larger volume of gas—provided, of course, that the machine used for compression can handle the larger volume. This is a relatively minor problem, involving only change of liners and pistons in a reciprocating compressor, or installation of "innards" to compensate for new throughput conditions in a centrifugal compressor.

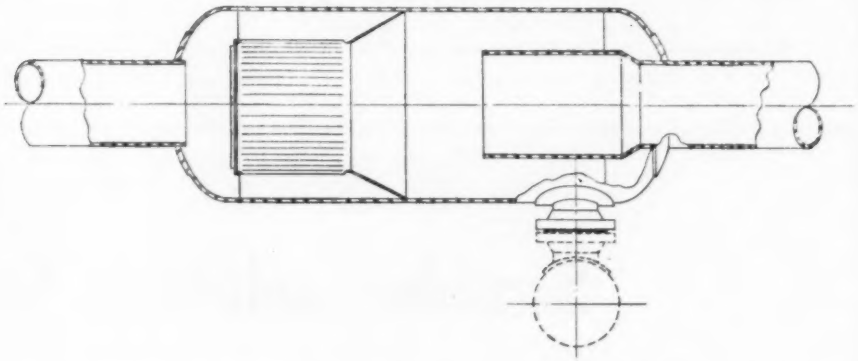
But the engineers' job does not end with the design of a loop capable of providing the increased quantities within existing horsepower limitations. Unfortunately for their calculations, some of the station auxiliary equipment probably will not have the capacity to handle the greater volume flow.

Engineers who have looped lines have encountered a serious bottleneck in the station scrubbers, whether of the wet or the dry type. In the first, gas flow exceeding the design maximum of the unit can cause carry-over of scrubber oil and/or entrained fluids in the line, with resultant damage to valves, pistons, rotors or other elements of the compressors. If of the dry type, scour can occur, or the device become so effective a throttle that the design pressure drop through the scrubber is far exceeded and line quantity reduced.

Trunkline Gas Co., faced with the problem of eventually doubling its initial throughput capacity,



Anderson Line purifier handles entire throughput with a pressure drop of less than 0.5 psi. It will pass 800 MMcfd at 2.0 pressure drop. Flow is from right to left, with trap line at left end.



RIGHT: Schematic cross section of above purifier. Flow is from 24-in. entry at left, against baffle plate, and then around squirrel-cage section and through slotted openings. Opening to trap is set below outlet nipple to reduce turbulence.

entered on a program of progressively looping sections of its line, each loop serving to deliver gas to the succeeding station at an augmented suction pressure. An 8000-hp station, under the revision, still served to move the increased gas volume. But the scrubbers would fail to keep abreast of new requirements. Called upon to pass volumes of gas greatly in excess of those for which they were designed—and for which they were ample in the initial line design—it appeared that the only solution of the problem would be that each time a loop was added the station affected would require supplemental scrubbers, so as to maintain the desired gas stream purity and to protect station equipment.

Such a program would require a renewal of construction work, with its attendant disruption of normal station functioning, and would call for a greatly expanded inspection force that satisfactory installations could be insured. Whereas the looping program itself, once the first legs of a series of loops extending out from stations had been tied in, would involve little or no interference with station routine.

These factors in mind, Trunkline engineers carefully weighed the limitations and costs of existing scrubbers available in the natural gas pipeline market, and went outside that list of manufacturers to investigate the possibilities inherent in equipment performing a similar type of separation. Two separators, used in central power plants to remove entrained moisture from steam over boilers or banks of steam generators, were investigated among others, and were found to handle widely varying steam flows with relatively slight changes in pressure drop or in effectiveness.

As of the end of 1959 Trunkline had installed nine of these "steam" separators in place of conventional gas pipeline scrubbers. Five are of one make, four of the other.

Each scrubber—one to a station—processes the entire throughput of the line under its design Q of 400 MMcfd, with a pressure drop through the unit on the order of ¼ lb; it will also meet the requirement of not exceeding a pressure drop of 2 lb when the throughput has been doubled to the maximum of 800 MMcfd. Efficiency of the scrubber holds practically constant down to 50 per cent of rated capacity, thus meeting summer operating conditions. Likewise each scrubber is capable of passing, and cleaning, an amount of gas double that of the line at the time of initial operation.

These two scrubbers, while differing in design details, are primarily of the same type and depend upon centrifugal force for their effectiveness. The steel shell, set into the suction line to carry the gas

stream through it on the same axis as the initial opening, contains within it a member consisting essentially of a series of vanes. These vanes are so fixed as to give the incoming gas stream a whirling motion, setting up centrifugal force which will propel solid particles, moisture and other impurities out against the shell. Here the rejected materials gravitate to the bottom of the horizontal drum, under the urge of the gas stream working ahead until they drop into the sump or catch basin built under the shell. This is provided with drain valve and waste line for voiding as experience determines.

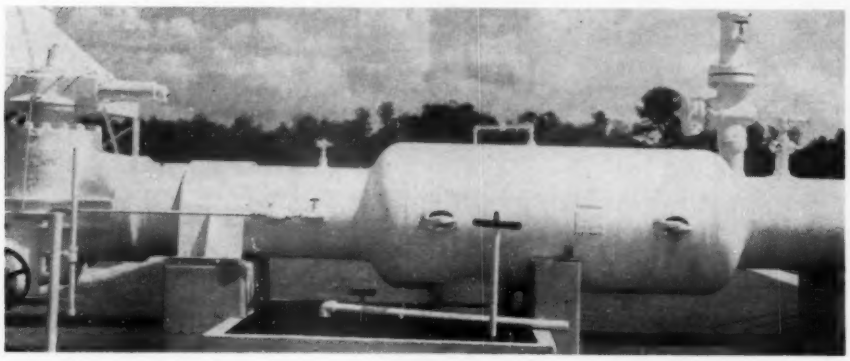
In one make of scrubber the incoming gas stream impinges on a strike or baffle plate, of thickness sufficient to withstand the impact of any entrained material. This plate turns the stream at right angles, after which it encounters the shell of the unit, which forces the flow through another 90-deg turn. Still another direction change is necessary before the gas can enter the (non-rotating) "squirrel-cage" section, in which fixed vanes impart a swirling motion to the gas. Once in this section of the scrubber, the stream is again forced to make a right-angle turn, to align with the outlet nozzle, which projects within the downstream head of the drum to a point past the area where the sump entraps the waste materials.

The other separator, instead of the "squirrel-cage" unit, utilizes a conical member, the apex of which is directed opposite the throat of the inlet pipe. The sides of this cone are made up of vanes, forming slotted areas in which the angle of the vane setting creates the centrifugal force as the gas rushes through the slots. To counteract the swirl at the entrance to the discharge nipple, this member is fitted with fixed vanes around its periphery, so faced as to counteract the rotation given the gas stream by the vanes in the cone.

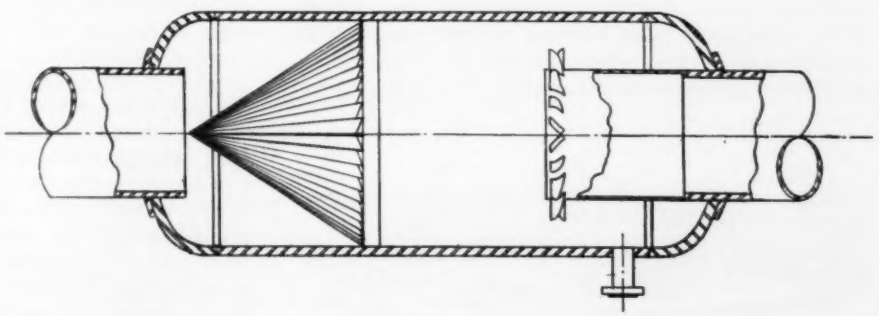
These separator-scrubbers, in addition to possessing the ability of passing augmented volumes of gas while holding within the maximum allowable pressure drop, also offer the advantage, twin advantages, so to speak, of low cost. On Trunkline's system with its present maximum winter throughput, one such unit does the work of three conventional vertical units. It requires only one set of valves, plus the addition of a bypass line to allow for annual scrubber inspection, as against three such sets of valves. It is placed directly in the suction line, and thus eliminates the manifolding and pairs of 90-deg ells—with their consequent pressure losses—the vertical units demand. It can be set on a small pad of concrete for weight support alone, instead of the base being required to withstand wind loads and pressure change thrusts.

Being of the dry type, these scrubbers require no provision for renewal or purification of scrubber oil, and need be blown down only as experience dictates when solid or fluid materials collect in the sump.

Also, since the base cost of any scrubber is the pounds of steel consumed in its fabrication, whether of the separately mounted vertical type or the hori-



Centrifix line purifier, with flow from right to left. The two inspection plates were installed on this first unit to permit observation of unit performance. The small pipe (to center of unit) is to equalize line pressure within sump section of cleaner.



RIGHT: Centrifix unit takes gas from the left, imparts whirling motion to stream as it passes through slotted cone, and dampens turbulence at outlet with fixed vanes on outlet nipple. Entry and outlet are full 24-in. pipe diameter.

zontal type carried in the station's suction line, the units employed by Trunkline effect a dual gain. They require but a single unit for present (and eventually doubled) flow as against three present and later additional units of conventional types; and they also weigh much less per unit, due to their compact design and absence of auxiliary supports.

Dollar-wise, the type of scrubber being used involves an outlay of only around $12,500, as against from $80,000 to $100,000 for conventional vertical cylindrical scrubbers of like initial capacity. The vertical scrubbers will also call for additional expenditures as each increment in the over-all looping plan is added.

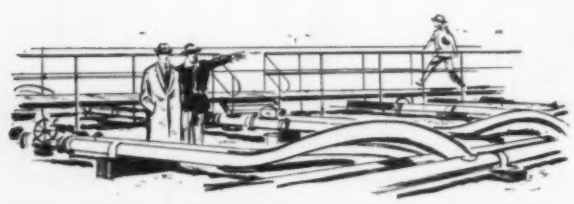
Where one unit supplies scrubber capacity for a station under present maximum operating conditions, and will continue to clean the gas stream up to the point where the looping program in effect becomes a doubling of the entire trunk, means for periodic inspection are provided. The station suction line, of 24-in. in present station design, is paralleled to a point beyond the scrubber with a 16-in. stub taken off the mainline and into the suction. It carries a 16-in. gate adjacent to the mainline.

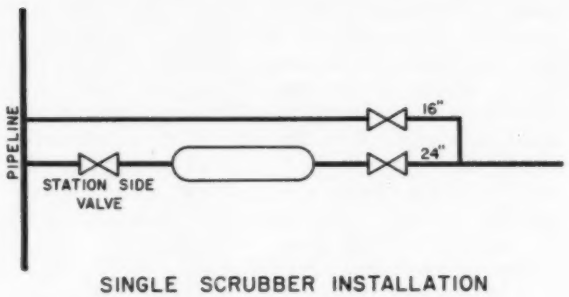
To inspect the scrubber, then, requires only its isolation through opening of the valve in the 16-in. bypass, closure of the 24-in. main suction gate and the corresponding valve between scrubber and the tie-in point of the 16-in. This involves operation of the station for the duration of the brief inspection period without benefit of a scrubber.

The increase in pressure drop caused by flow through the section of 16-in. instead of the normal 24-in. scrubber equipped line, is of such slight importance that the loss in throughput thus sustained is more than offset by the difference in cost between an additional 24-in. valve and the 16-in. installed in the bypass.

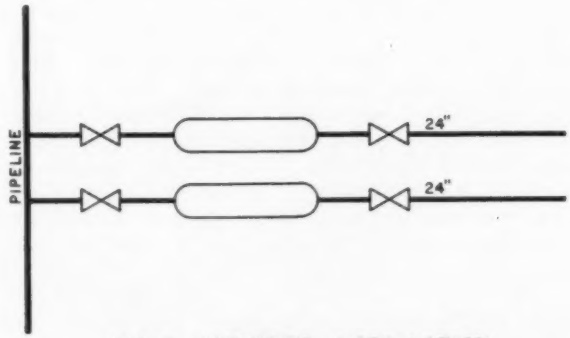
When the system throughput reaches a rate of 800 MMcfd the limit of compressor capacity at existing installed horsepower will have been reached, and additional prime movers and compressors will have to be installed. At such time a second suction line to the station will be laid parallel to the existing suction, with a second scrubber alongside the one first installed.

With two scrubbers and dual suction lines, either scrubber will carry the entire gas stream for such time as it may be necessary to hold the other scrubber off the line for inspection. Again, the pressure drop sustained while the one scrubber and short section of 24-in. handle the entire station load will be of little consequence when weighed against the cost of providing a bypass system capable of passing the maximum volume without increased drop of pressure.





SINGLE SCRUBBER INSTALLATION



MULTI SCRUBBER INSTALLATION

Scrubber installation (above) as now operating. The 16-in. by-pass is to allow scrubber shutdown for inspection. Dual scrubbers (below) are for use when original 26-in. line is completely looped with 30-in. Either scrubber can then be taken off line for inspection while other unit carries entire station suction load.

The same program of progressively looping the dual lines as was followed previously will again find the scrubber capacity equal to the augmented load, up to the point where the 30-in. looping has progressed to form a third main trunk. This, of course, without adding to the horsepower required when the revision is made at the completion of the first line paralleling the original system.

Trunkline has had four years' experience with this type of scrubber. Six units are installed ahead of reciprocating stations, three ahead of centrifugal compressors. During the four years operation there has been noted no excessive wear in gate valves, pistons, compressor valves, or rotors in the centrifugal compressors. All units have operated satisfactorily at summer maximum throughputs of 200 MMcfd as well as at the augmented flows when Q has passed the 400 MMcf mark. Low first and installed costs, absence of auxiliary equipment and moving parts, a wide capacity range within the set pressure drop of 2 lb maximum; all these are among the factors which have justified the excursion of Trunkline engineers outside the pipeline industry's list of accepted equipment for gas cleaning. An excursion which has brought them scrubbers to meet adequately the "tending to expand" portion of the definition quoted at the outset of this article. ■

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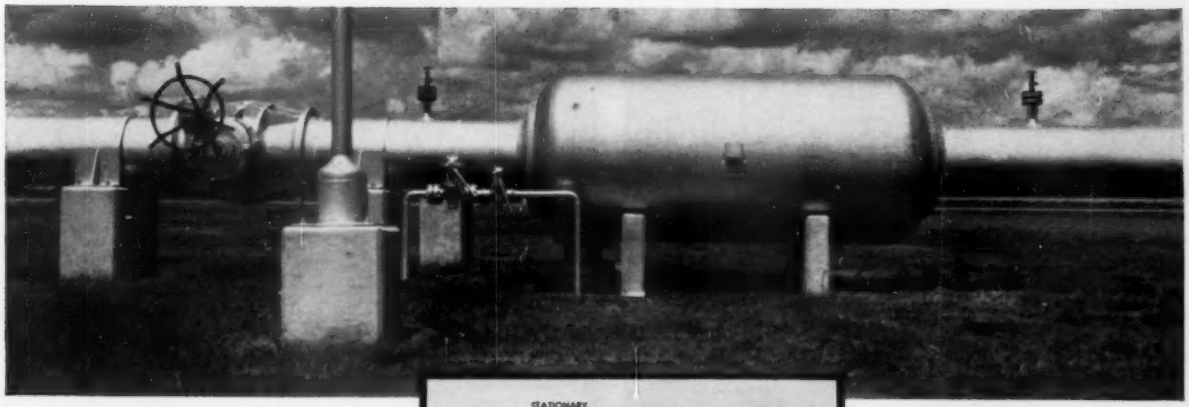
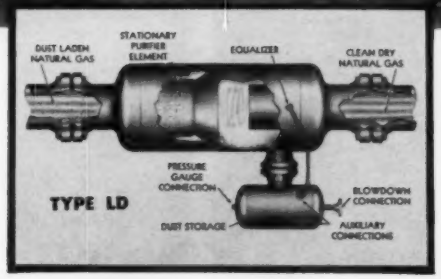
This is Hi-eF

—the Gas Scrubber That Successfully Handles Widely Varying Throughput





Type LD Scrubber
Trunkline Gas Company

Wherever men in charge of gas operations get together you hear about the job Anderson Hi-eF Purifiers are doing in efficiently scrubbing greatly varying volumes of gas in a system. Even though throughput exceeds the intended volume, Hi-eFs do virtually a 100% job. Hi-eF Purifiers remove all objectionable dry dust entrainment and direct it to a storage reservoir from where it is blown down periodically to atmosphere. And it removes all liquid. There's no maintenance, no moving parts, no filters or screens. Hi-eFs occupy only a fraction of the space of conventional scrubbers, cost less and are guaranteed to do your entrainment removal job.

Get all the facts on Hi-eF Purifiers, recommended best by gas operation engineers. Send for Bulletin 601.

ANDERSON Hi-eF PURIFIERS

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On the Job with

IN PENNSYLVANIA—Transco's 164-mile Leidy Line, connecting their main line with a new storage field in the north-central part of the state, requires some of the Bethlehem 24-in. pipe to be laid almost straight up.

IN NEW MEXICO—Utex Exploration Company and Charles A. Steen of Moab, Utah, build a gathering line by laying 3-in. Bethlehem buttweld pipe right on the surface of the ground.

Our new mills are geared to turn out pipe in larger tonnages than ever before. And it's line pipe that's thoroughly dependable, too. Every length is straight and true to round and bevel, right up to specs, and rigorously tested and inspected at the mill.

It's easy to check all the facts about Bethlehem Line Pipe—just call the Bethlehem sales office nearest you.

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For strength
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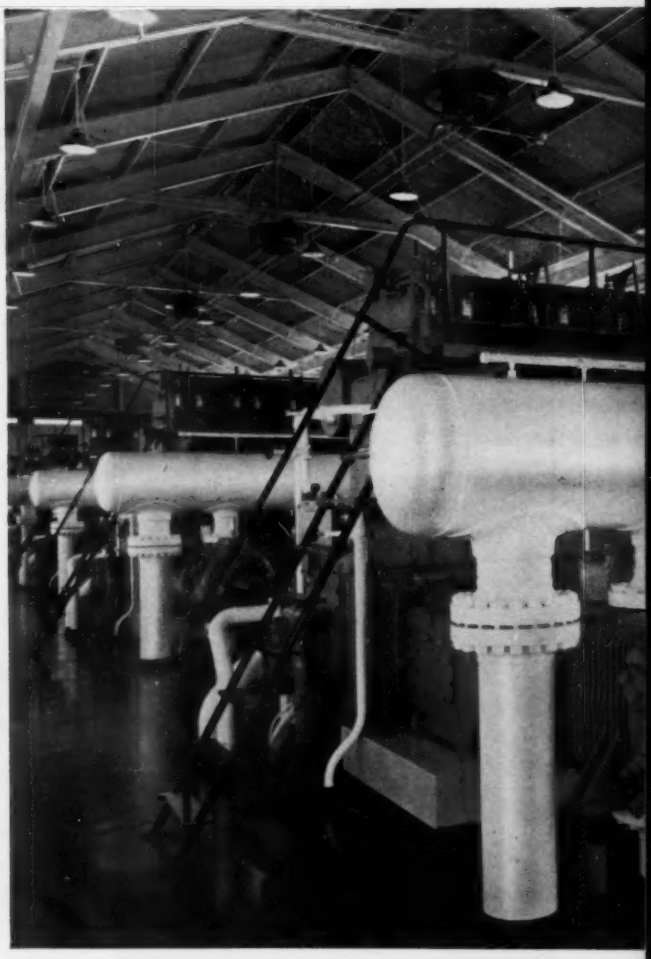
Steel

Bethlehem Line Pipe

IN VIRGINIA—Commonwealth Natural Gas Corporation pushes a looping line through the tangled Blackwater Swamp. The Bethlehem 12¾-in. pipe weathered the construction battle perfectly.

FROM COLORADO TO CANADA—Pacific Northwest Pipeline Corporation's 1,487-mile main line required 13 compressor stations, each using Bethlehem 22- and 26-in. Mayari R high-strength pipe exclusively.



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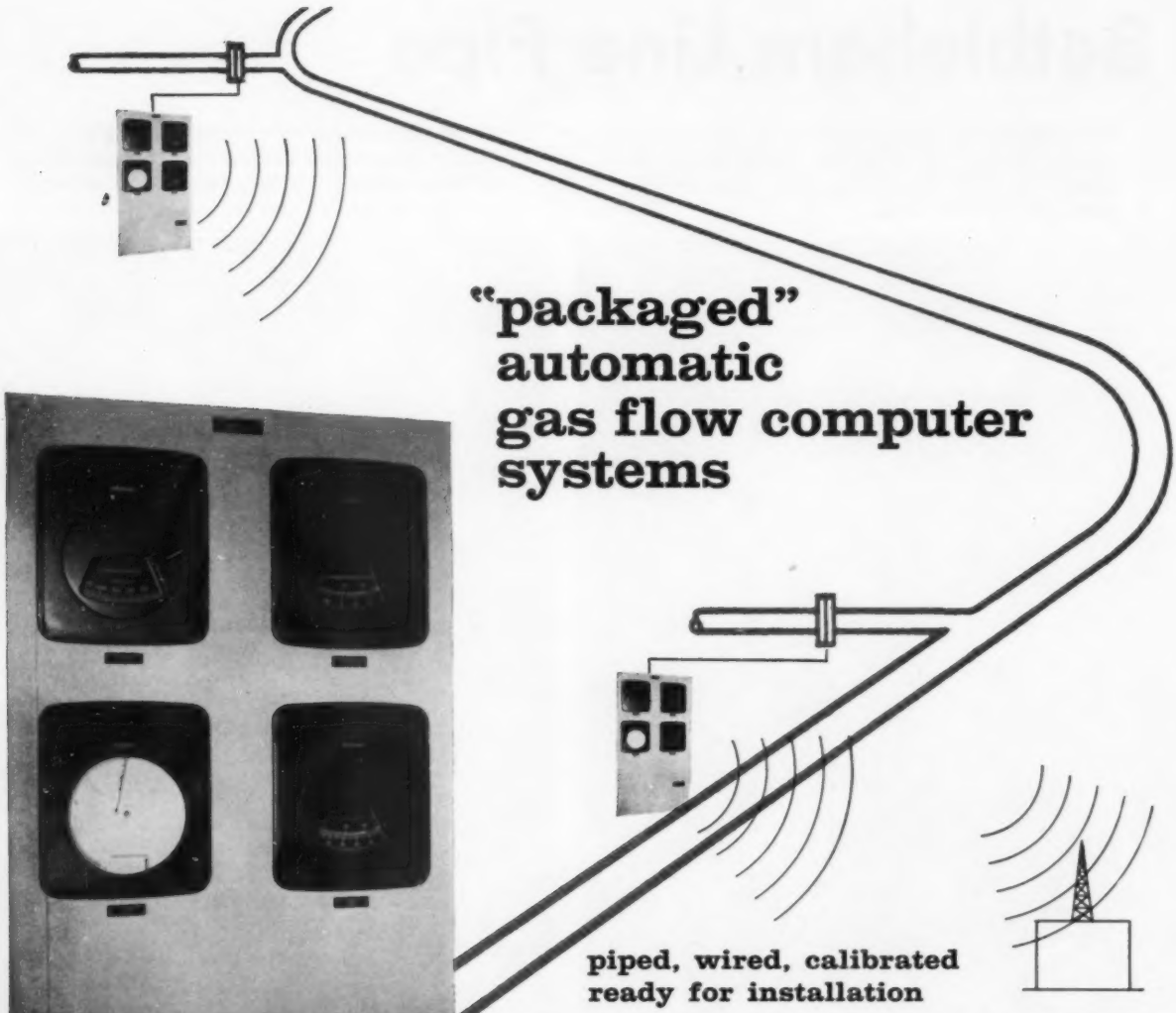
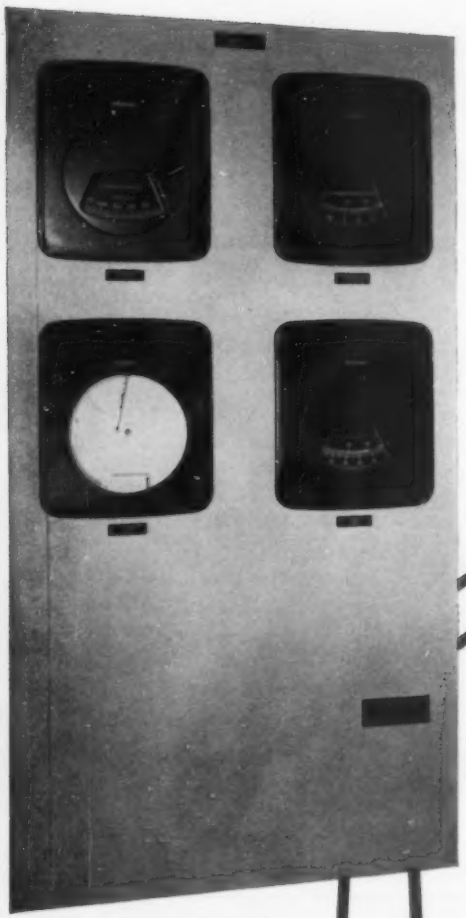
HYDRAULICALLY EXPANDED ELECTRIC FUSION-WELD (submerged arc)	18 to 42	¼ to ¾ incl.	40 ft	API 5LX, Grades X42, X46 & X52 Also X-56 (non-API)
ELECTRIC RESISTANCE-WELD	5⅝ to 16	API	to 60 ft	API 5L, Grades A & B API 5LX, Grades X42 & X46
CONTINUOUS BUTTWELD	½ to 4½	API	SRL 24 to 26 ft DRL to 50 ft	API 5L

BETHLEHEM STEEL

BETHLEHEM STEEL



"packaged" automatic gas flow computer systems



Typical Foxboro Gas Flow Computer Differential and static pressure instruments (right side of panel) convert measurements to electrical inputs for the Dynalog Computer-Telemeter (lower left). Instrument at (upper left) telemeters down-stream gas pressure.

piped, wired, calibrated ready for installation

A continuous record of gas flow — into or out of your pipelines — that's the information a dispatcher gets automatically with the Foxboro Gas Flow Computer.

Foxboro systems do their computing at the meter station, automatically compensating for gas temperature and pressure, and transmit total flow values. Transmission errors common to systems that compute at the receiving end are eliminated. Transmission line space is saved as well.

Foxboro Gas Flow Computers are furnished as a complete packaged unit — calibrated and tested as a system before shipment. Installation is as simple as setting the panel unit in place — making connections. Computers are available for both single and multiple meter runs.

Ask your local sales engineer about the Foxboro Gas Flow Computer. He can tell you about many installations in successful operation. **The Foxboro Company, 344 Norfolk Street, Foxboro, Mass.**

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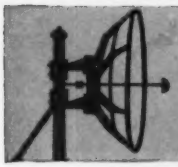
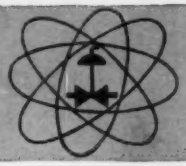


Communications and Automation



Edited by FRANK CHAPMAN

Columbia plans 4-state microwave system

THE Columbia Gas System has taken the first step toward construction of a four-state, 470-mile microwave communication system.

This system, designed for 240 communication channels, is part of a broad automation program now under way. Purpose: To make possible more efficient and more economical service for Columbia's customers.

Under a contract signed with Collins Radio Co. (Dallas), United Fuel Gas Co. (Charleston, W. Va.), a subsidiary of Columbia, will construct the first leg, covering the area between Prestonburg, Ky. and Cedarville, W. Va. Cost of the first leg of the microwave system will be $875,000. The completed system will cost around $1.5 million.

Ultimately, this microwave system will extend into Pennsylvania, Ohio, Kentucky, and West Virginia. If viewed on a map of the region, it would present a U-shape extending south from Columbus, Ohio, to Huntington, W. Va., then east to Charleston, W. Va., and north to Pittsburgh.

The 470-mile system will have 29 stations. The first leg will be owned and operated by United Fuel Gas. Its installation work will begin next summer, and is expected to be completed in the fall of 1960.

Equipment to be used on the entire system will be made by the Texas division of Collins Radio.

The microwave system will provide Columbia System operating companies with voice communication, a teletypewriter service, facsimile facilities for telemetering, supervisory control, and data communication.

Other segments of the system are to be constructed by Ohio Fuel Gas Co. (Columbus) and Manufacturers Light & Heat Co. (Pittsburgh).

The section to be owned and operated by Manufacturers Light will extend from Pittsburgh south to Weston, W. Va. There, it connects with United Fuel Gas at Cedarville. It will have stations at Pittsburgh and Washington, Pa.; and at Cameron, Salem, Hundred, and Weston, all in West Virgina.

The section to be owned and operated by Ohio Fuel will extend from Marble Cliff (a Columbus suburb), south to German Ridge and Huntington in West Virginia; and have stations at Marble Cliff, Goodale-Columbus, Columbus, Mount Sterling, Benton Auxiliary, McArthur, Dry Ridge, South Point, and South Point Repeater, all in Ohio.

On the United Fuel leg of the system, stations will be located at Cedarville, Frametown, Barton, Huntington, Clendenin, South Hills, Charleston, German Ridge and Culloden, all in West Virginia; and at Prestonburg, Prestonburg Repeater, Inez, and Walbridge, all in Kentucky.

The installation, a fully d-c system, will operate in the 6000-mc band of frequency allocations, subject to approval of the FCC. System power source will be 24-v battery banks. Standby generators will satisfy all a-c requirements including chargers, tower and building lights, and antenna heaters.

The RF equipment employs hot standby operation, which consists of both main and standby equipment fully empowered with the standby ready to assume the communication load rapidly in case of failure of main equipment. Carrier equipment provides for standby or redundant operation for all units that affect 13 or more voice channels. Alarms are provided in case of failure of RF or carrier equipment.

Tower height will vary from 120 to 300 ft. Four 20-ft x 24-ft billboard passive reflectors and two "back-to-back" parabolic antenna passive reflectors will be used for relaying signals.

The Collins RF receivers in the Columbia Gas System operate in the 6000-mc band, supplying a linear broadband characteristic for carrier equipment. Collins RF transmitters generate a microwave RF signal carrier in the 600-mc range, frequency modulated with a carrier deviation of plus or minus 3 mc.

In Columbia's system, a completely synchronous installation, all carrier frequency generation equipment is "locked" to a master oscillator with provisions for any station to take over the role of master station in event of a partial system outage.

Voice multiplex separation is accomplished by Collins mechanical filters, which provide filtering characteristics formerly obtainable from only expensive crystal-lattice techniques.

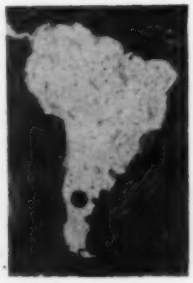
Fault-finding equipment tones are impressed directly on the baseband, avoiding interruption to carrier channels.

The Collins microwave channeling equipment uses a single-sideband suppressed-carrier multiplex system. This scheme allows use of statistical loading techniques providing many more usable channels. Each voice communication channel in Columbia's system has a bandwidth of 200 to 2900 c, plus or minus 2 db. ■

"They engineered this oil line to a cat's then wrapped it

One of the world's largest pipeline operators chooses the world's toughest tape coating for new Patagonian oil line

A leading international pipeline company recently wrapped over 100 miles of crude oil gathering and transmission line with Polyken No. 960 Extra-Strength Pipeline Roll. The pipe ranges from 2 to 14 inches in diameter.

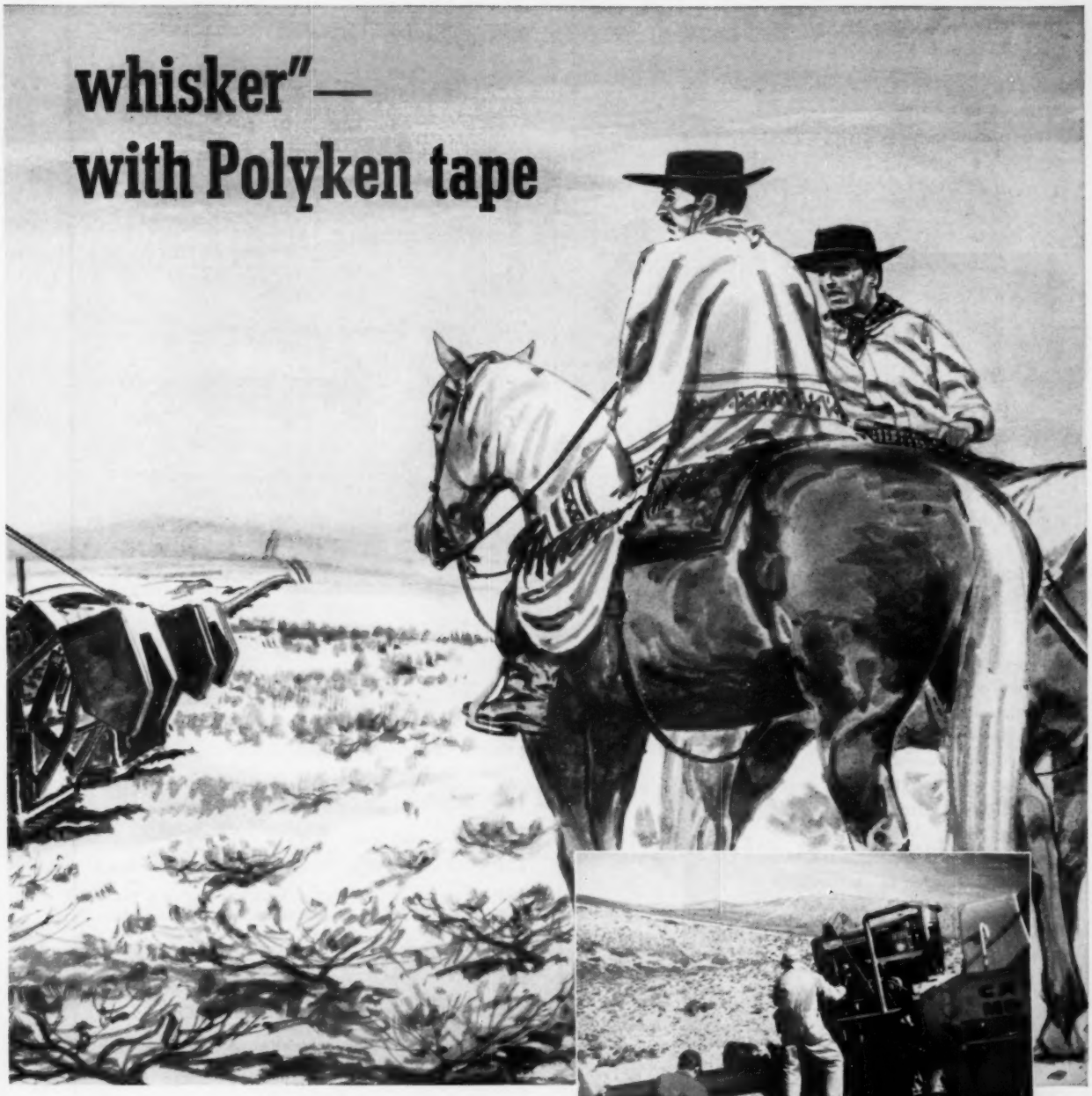


An Example of Perfection

The new line, which crosses part of the Patagonian plateau of southern Argentina, is an example of perfection in pipeline design. "They engineered it to a cat's whisker," is the way a seasoned pipeliner put it.

In their construction plans, the engineers specifically called for Polyken No. 960 Tape as the protective coating. Seven years of private testing and study had convinced these people that Polyken

whisker"—
with Polyken tape



delivers the durable, practical protection that a precision-built line needs. Quite a few other major oil and gas companies have come to share this conviction in recent years.

The Man to See

There's a lot to be said for Polyken tape. There's the frequent, substantial saving, the ease of application, the speed and performance, and more. See your Polyken representative or call the Polyken tape coating distributor near you. Or simply write Polyken, 309 West Jackson Blvd., Chicago 6, Ill.

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Using tensioned-spindle equipment, pipe is cleaned and wrapped in one factory-smooth operation. Polyken tape is always ready. No primer, no drying or cooling. No fumes or fire hazard.

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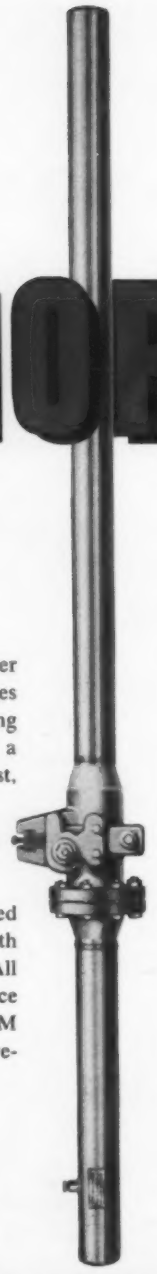
The Daniel Junior flangnek meter tube provides operating advantages not found in simple, plate holding devices. The Junior fitting has a rack and pinion mechanism for fast, safe plate changing. Once the line is depressured a few turns of the speed wrench raises the plate clear of the fitting. Upstream tubes are factory-aligned with the fitting to form a smooth approach to the orifice plate. All specifications are in accordance with AGA, ASME, and ASTM standards. See your Daniel representative for all the facts.



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136

GAS CALENDAR

April

5-7..AGA Sales Conference on Industrial & Commercial Gas—The Shamrock-Hilton, Houston.
5-7..7th Annual Gas Compressor Institute—National Guard Armory, Liberal, Kan.
8-9..Florida-Georgia Gas Association Convention—Biltmore Hotel, Palm Beach, Fla.
12-13..32nd Annual PIEA-PESA Conference and Exhibition—Municipal Auditorium and Muehlebach Hotel, Kansas City, Mo.
19-21..Southwestern Gas Measurement Short Course—University of Oklahoma, North Campus, Norman, Okla.
19-21..AGA Research & Utilization Conference—Hotel Carter, Cleveland, Ohio.
21..Pennsylvania Gas Association's Annual Production Meeting—Drexelbrook Swimming & Tennis Club, Drexel Hill, Pa.
21-22..PCGA Home Service Workshop—Huntington Hotel, Pasadena, Calif.
21-22..Indiana Gas Association—French Lick-Sheraton Hotel, French Lick, Ind.
25-27..AGA-EEI National Conference of Electric & Utility Accountants—Roosevelt & Commodore Hotels, New York.
25-27..Southern Gas Association Annual Convention—Galveston, Texas.
28-29..PCGA Distribution Conference—Benson Hotel, Portland, Ore.

May

9-13..AGA Commercial Gas School—Edgewater Beach Hotel, Chicago.
9-13..AGA Operating Section, Joint Distribution & Transmission Conference—Hotels Roosevelt & Jung, New Orleans.
12-13..AGA Eastern Gas Sales Conference—Statler Hotel, Washington, D. C.
16-18..AGA Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.
23-25..AGA Operation Section Production Conference—Hotel Roosevelt, New York.
24-26..Pennsylvania Gas Association Annual Meeting—Pocono Manor, Pa.
25-27..PCGA Combined Transmission and Accident Prevention Conference—Hotel Utah, Salt Lake City.

June

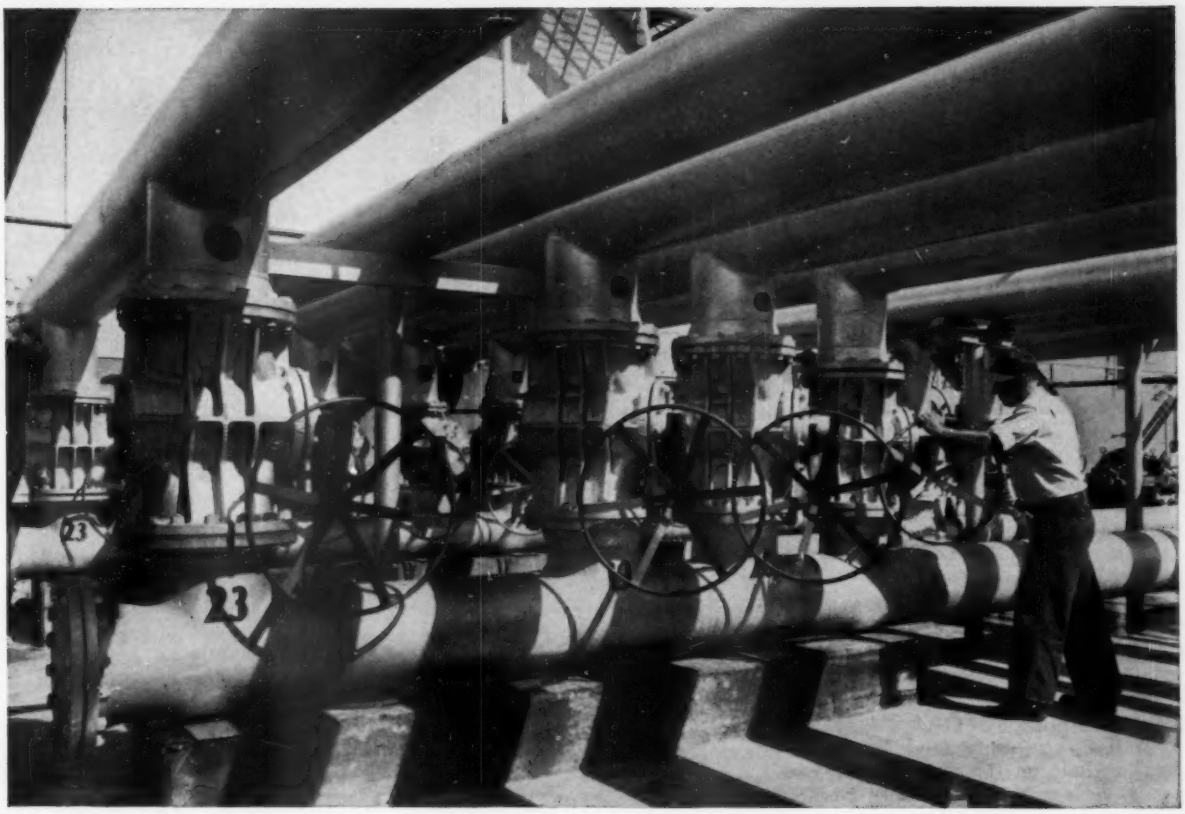
1-3..5th Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.
6-7..PCGA Research & Utilization Conference—Miramar Hotel, Santa Monica, Calif.
8-9..PCGA Customer Service Conference—Miramar Hotel, Santa Monica, Calif.
22-25..Canadian Gas Association Annual Meeting—Manoir Richelieu Hotel, Murray Bay, Que., Canada.
27-28..Michigan Gas Association Annual Meeting—Grand Hotel, Mackinac Island, Mich.

September

21-23..PCGA Annual Convention—Westward Ho Hotel, Phoenix, Ariz.

October

10-12..AGA Annual Convention—Atlantic City, N. J.

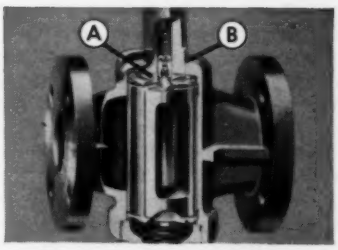


When it comes to quick, efficient control of petroleum products . . .

these Homestead® Lubricated Plug Valves handle 2,000,000 barrels a month!

At the West Coast marine terminal shown above, the tremendous flow of gasolines and oils from storage and tankers demands smooth, positive operation at all times. For this reason, 33 Homestead Lubricated Plug Valves in sizes from 8" to 16" were specified for this installation.

Today more and more oil companies specify Homestead Valves for their dependable, maintenance-free performance and built-in engineering advances. For example, *100% pipe area* reduces ship loading and unloading time. *Pressurized chemical seal* and closely fitted plug and body assure positive shut-off, no mixing of different fluids. *Controlled lubrication* provides full coverage of sealing surfaces without contamination of line fluids. *Quick operation* . . . Homestead Valves are fully opened or closed in a quarter turn of the plug.



Cross-section of Homestead Lubricated Plug Valve. Triple head seal (A) prevents leakage. Tell-tale lubricant ring at (B) signals full system, prevents waste of lubricant and contamination of line fluids.

For complete details and valve recommendations for *your* application, mail coupon below.

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Homestead Valve Manufacturing Co.
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Company.....

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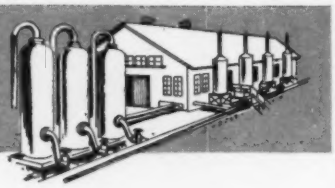


New gas turbine developments discussed at ASME conference

THE 5th annual conference and exhibition of the Gas Turbine Power Division of ASME, held jointly with the society's Hydraulic Division at Houston, March 6-9, cleaves naturally into four parts for the gas engineer.

Of these, the exhibition of new turbines and compressors is one; the most complete symposium on compressor stall, surge, and system response, requiring 11 papers and occupying three joint sessions, is a second. The third and fourth parts include on the one hand papers covering experiences with gas turbines on various fuels, and descriptions of new developments in turbine design.

• Compressor stall

The phenomenon of compressor stall is one of the most important and at the same time least understood in compressor technology. Many advances must be made before a reasonable, integrated understanding is at hand of the effects of the large number of aerodynamic, mechanical, and environmental factors which play important roles.

The symposium on compressor surge and stall presented a general introductory paper. This was followed by papers dealing with instability and surge in dual entry centrifugal compressors; the use of experimentally determined acoustic impedance in analysis of propulsion system stability; sonic control of dynamic compressor instability; stall control; parallel operation of turbo-compressors in a common system; the surge problem as related to the ASME compressor test code PTC 10-1949; effect of induced vorticity in the vaneless diffuser on performance of a centrifugal compressor; generalized multistage compressor characteristics; tip clearance effects on stalling pressure rise in axial flow compressors; and aspects of stall flutter and compressor blade vibration.

To simplify coverage of the symposium, the ASME has bound brief expositions of the 11 papers within a single cover, available through the New York City headquarters of the society.

• New developments

Among papers covering developments in gas turbines was R. L. Boyer's description of Cooper-Bessemer's 10,500-hp gas turbine, which uses a modification of the J-57 jet engine, combining with it a two-stage power turbine for driving a centrifugal compressor. This is the unit being installed this year by Columbia Gulf on its pipeline at Clementsville, Ky.

Another unit described was Solar Aircraft's 1100-hp gas turbine for marine and land applications. In gas pipeline service, this high speed turbine is direct-connected with a Solar multistage compressor. This compressor has a series of interchangeable wheels and other parts which allow the unit to be readily adapted to varying conditions of flow. This is the type of equipment being installed on an experimental basis by Trunkline Gas Co. at its Cypress, Texas, station.

• Single shaft turbine

Clark Bros. 9000-hp single shaft gas turbine was carried through its development in another paper, presented by the engine-building firm's O. C. Schoeppner. The turbine has but two bearings, outside the compressor section at one end, and the turbine exhaust at the other. The stiff-shaft design incorporates a spool between compressor and turbine disc rotors, and has dual vertical combustion chambers whose gas streams are kept separate until reaching the turbine nozzles.

Most of the papers dealing with gas turbine performance were concerned with power applications, either in large industrial installations or in electric power-generating plants. While the several authors made no attempt to compare gas turbine installations with either steam or diesel plants, it was brought out in the floor discussions that in many instances the gas turbines would compare favorably with other types of power generating equipment.

• Peak demands

One of the developments described covered the use of relatively small gas turbine plants, strategically located, for meeting peak demands. The British utility admitted that the over-all efficiency and fuel consumption rates for these small turbine units could not match those of the large, steam plants; the savings in first cost over the provision of steam generating plants of capacity sufficient to cope with peak demand tipped the scale favorably for use of the gas turbines. The speed with which the turbine generated power could be made available, as contrasted with the length of time to get an auxiliary steam plant in operation, also counted heavily for the turbine plants. Such installations, found desirable in England despite its high fuel costs, should make of prime importance the consideration in low cost fuel areas of gas-turbine powered standby or peak load generators.

• Advances

The exhibits, when compared with those of earlier showings at Gas Turbine Division meetings, illustrated the phenomenal advances in turbine design and construction, and presaged wide acceptance of this type of power as still further refinements are made in metals resistant to high temperatures and in basic designs.

The 1961 Gas Turbine Division conference is scheduled for Washington, D. C., March 5-9.

Computer stops problems before they start

THE use of an electrical analog at a research lab is reducing costly piping alterations at new compressor stations. Worthington Corp. has installed the machine at its new research labs in Buffalo, N. Y.

With the analog, Worthington engineers create electrical analogies which accurately predict machine and system performance before design and construction are finalized. Engineers can spot in advance vibration patterns that cut efficiency and cause maintenance problems.

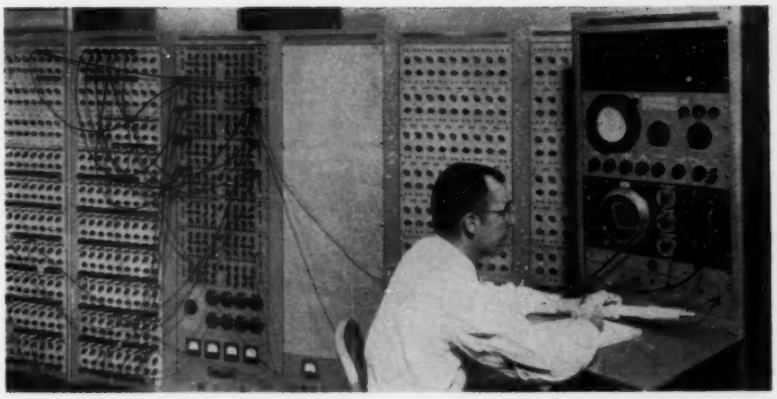
To prevent harmful vibrations and pulsations, each stroke of compressors and length of each piece of pipe must be carefully coordinated.

Coordination is the job of the analog.

Electrical resistors and capacitators take the place of each piece of pipe in blueprints. Engine speed and an exact relationship of each component from one moment to the next must also be electrically accounted for in the analog.

Once the machine is set and turned on, vibration patterns in designed piping produce a wave shape on a panoramic analyzer. Problems are seen in advance and changes in plans made before construction work begins.

Worthington has added several features to its analog. On it, engineers can duplicate the exhaust or air intake piping of big compressor engines. This makes it possible to study other fields, such as overall engine turbocharger efficiency.



Electrical analog creates electrical circuit analogies which accurately predict compressor station machine and system performance before design and construction are finalized.

Price, supply problems to stay

PRICE and supply problems, says John F. Lynch, will be of even greater concern to the gas industry in the future. He believes that one answer may be that "we'll have to change our concept of the gas industry to become something entirely new — an energy industry." Lynch is senior vice president of Texas Eastern Transmission Corp. and president of La Gloria Oil & Gas Co. He made his remarks before a recent meeting of Natural Gasoline Association of America in Corpus Christi, Texas.

Cost of transportation and distribution, and regulation were listed as major obstacles in the delivery of natural gas compared to other fuels. ". . . From the wellhead to the burner tip, its movement has to be approved by at least four state and federal regulatory groups," he said.

It is estimated that within 25 years, we may be far enough along in our program of discovery, development, and depletion to foresee and predict, with reasonable accuracy, exhaustion of our natural gas resources.

"By the year 2000, the gas industry may be comprised of plants capable of making vast quantities of gas. The industry may depend on huge base load gas manufacturing installations located in coal fields and oil shale areas, with gas they make transported to market via pipelines—existing and new.

"The flow of gas will assume a new pattern—unlike today's. Smaller local gas-making plants will be necessary to provide for peak-shaving and emergencies."

The most exciting feature of tomorrow's gas or energy industry will result from application of such devices as the fuel cell and new techniques for producing heat at maximum efficiency from the gas supply.

Transmission costs will be reduced through higher pressures, bigger compressors, greater use of automation.

Looking at the future, Lynch said that many new long distance gas lines will have to be built if we are to transport 2½ times as much gas to meet demands 25 years from today. He sees a trend to larger diameter pipe. Today's 36-in. line will be small compared to 42-, 48-, 54- and even 60-in. lines of tomorrow.

Northern withdraws Otis storage plan

Northern Natural Gas Co. is withdrawing its request to turn the depleted Otis, Kan., gas field into an underground storage area.

W. A. Strauss, executive vice president, said that Northern is not giving up the rights it has acquired on land over the storage reservoir. However, further activity must be postponed until advisability of integrating the Otis reservoir into Northern's over-all storage program is re-examined.

Northern first filed on Otis in July 1959. Activity has been confined to reconditioning injection-withdrawal wells. No gas has been injected. The original plan called for ultimate storage of 182 billion cu ft of gas.

Gulf has new producer

Gulf Oil Corp. is completing as a dual producer a gas discovery well 17 miles north of Port Isabel, Texas, on Padre Island. The well tested 3 MMcfd on a ¼-in. choke with flowing pressure of 2175 psig at 6043 to 6052 ft. Another test at 6468 to 6480 ft measured 3.25 MMcfd on a ¼-in. choke with a flow pressure of 2250 psig.

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Photo courtesy National Supply Co.

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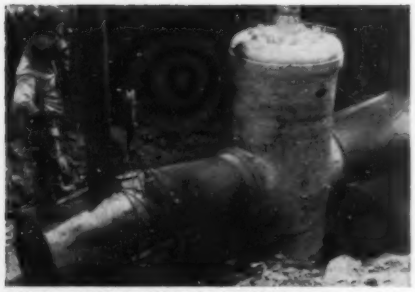

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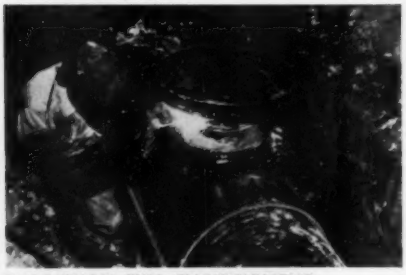

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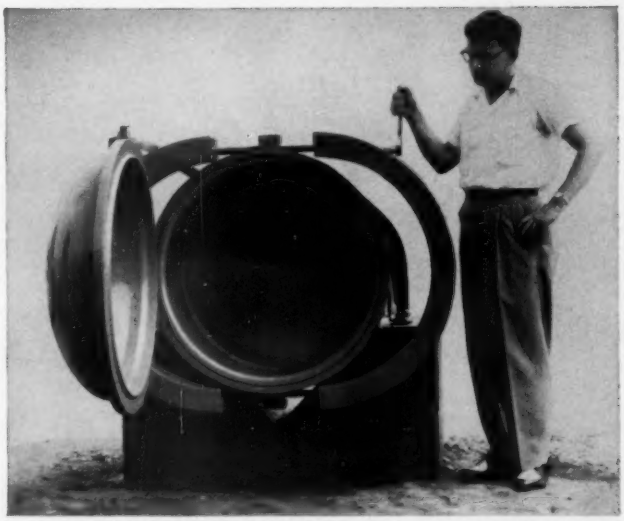

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Commingled gas stops exemption

OKLAHOMA Natural Gas Co.'s request for exemption under the Natural Gas Act has been denied by FPC. Oklahoma Natural wanted the exemption so that it could carry out a gas exchange agreement with Consolidated Gas Utilities Corp. without becoming subject to FPC jurisdiction.

The commission ruled that if the company carried out its proposed transaction, it would become a "natural-gas company" subject to the Natural Gas Act.

Consolidated Gas transports gas from Texas to Oklahoma and Kansas. The exchange agreement provided for Consolidated to supply Oklahoma Natural with about 6 MMcfd for its system in the Clinton, Okla., area and its Sayre storage field. In turn, ONG would deliver equal volumes to Consolidated near Enid, Okla.

The difficulty arose from ONG's proposed delivery of Oklahoma-produced gas into Consolidated's interstate system. The commission said it was inevitable that some of this Oklahoma gas commingled with Consolidated's, will be physically transported and consumed outside of Oklahoma.

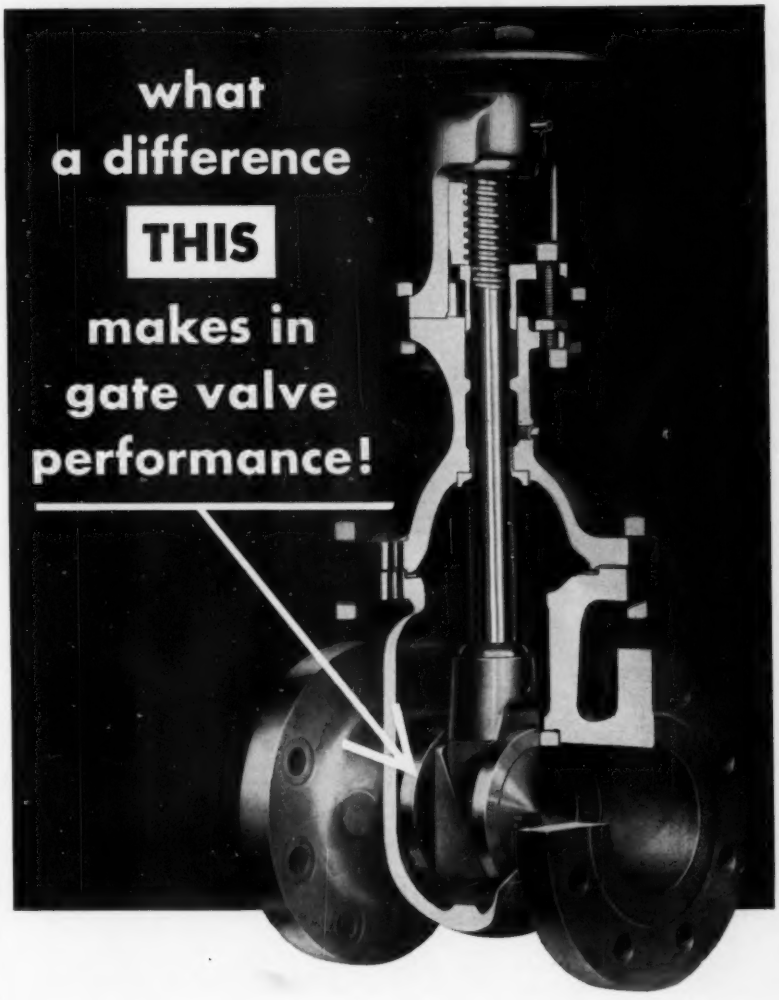
In a dissenting opinion, Commissioner Arthur Kline pointed out that more than 40 per cent of all marketed gas is sold and consumed by the state that produces it. Most of this is sold to pipelines operating both intrastate and interstate. In almost every instance, he said, there is some commingling of interstate and intrastate gas, and the effect of the decision—if upheld—would be to bring all these intrastate sales under its jurisdiction.

El Paso's Willamette valley line okayed

El Paso Natural Gas Co. has a temporary certificate to build new facilities in Washington and Oregon (Docket G-19393).

The $10.4 million project consists of about 121 miles of 10.75- to 20-in. pipe. It would extend from El Paso's existing 26-in. mainline in Corlitz county, Wash., and end at Eugene, Ore.

Deliveries will be made to Northwest Natural Gas Co., Portland, at Portland, Salem, Albany, and Eugene.



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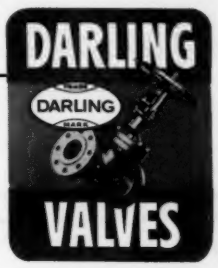

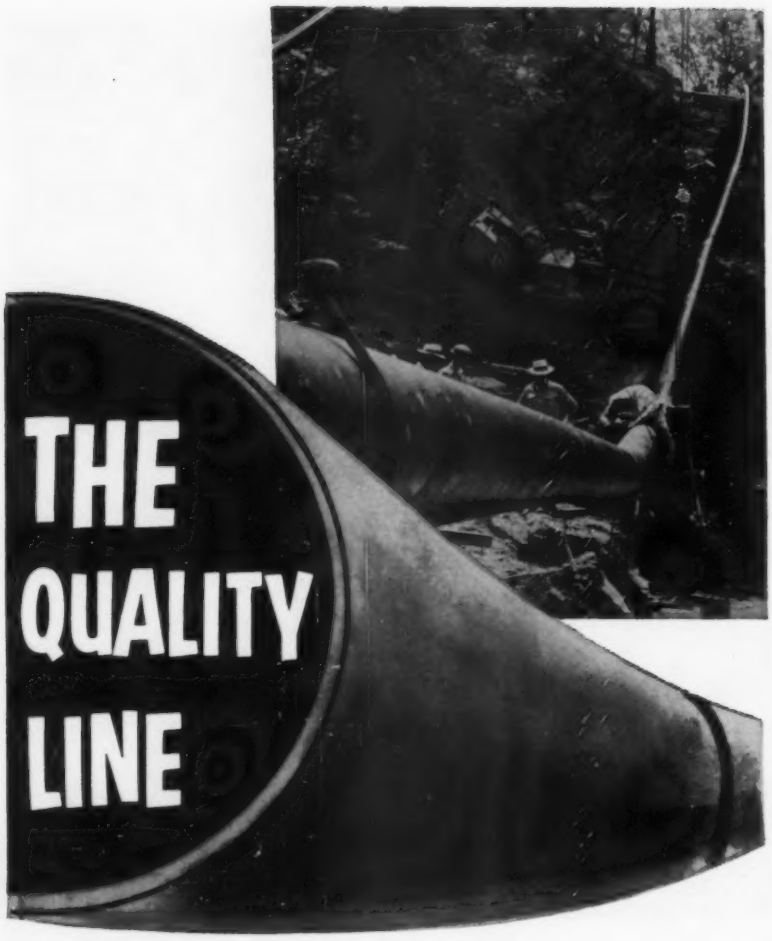

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Glick field gas goes to Northern Natural

Five independent producers can sell gas to Northern Natural Gas Co. from Glick field in Kiowa, Comanche, and Barber counties, Kan.

Examiner Robert M. Weston conditioned the certificates on an initial price of 16 cents per Mcf. Producers proposed an initial price of 20 cents.

Under the decision, the price can be raised to 20 cents one day after service starts. However, the 4-cent differential must be held by producers subject to refund pending future hearings and final determination of proper price levels by FPC.

Glick field is an important new discovery involving total recoverable reserves of some 271.3 billion cu ft of high pressure gas. About 243.3 billion cu ft are dedicated to Northern. The remainder is expected to be available to Northern in the future.

FPC denies plan to aid utility district

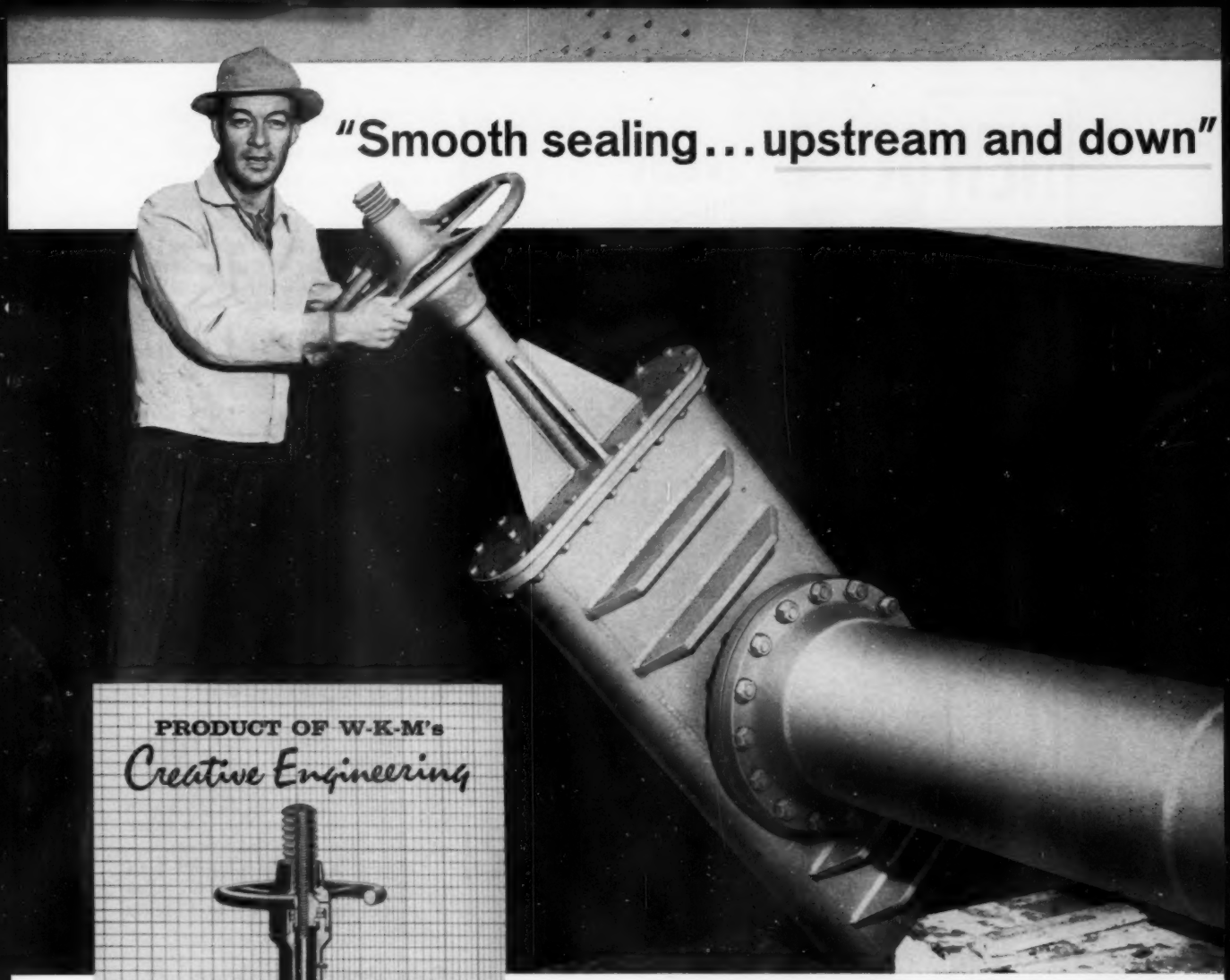
An FPC presiding examiner turned down East Tennessee Natural Gas Co.'s plan to provide additional gas to Middle Tennessee Utility District (Docket G-19530).

East Tennessee wanted to deliver 731.7 MMcfd to the district's proposed "Project C." The company has been supplying two other areas.

East Tennessee offered to build necessary laterals after FPC declared the project "financially and economically unfeasible" for the District. The combined undertaking would be justified, the examiner said, if East Tennessee's other customers would not have to pay increased rates because of deficiencies in the cost of service for Project C. He found, however, that they would have to bear more than 70 per cent of the cost of the laterals.

Air force base gets gas

Montana-Dakota Utilities Co. can build facilities to bring gas to Glasgow Air Force Base in Valley county, Mont. (Docket G-18604). About 15.5 miles of 6.625-in. line and 2 miles of 4.5-in. field lines, plus 1540-hp additions at two stations are involved. With the new facilities, Montana-Dakota also will be able to attach a new gas supply from the Carter Oil Co. in Elk Basin field, Carter, Wyo.



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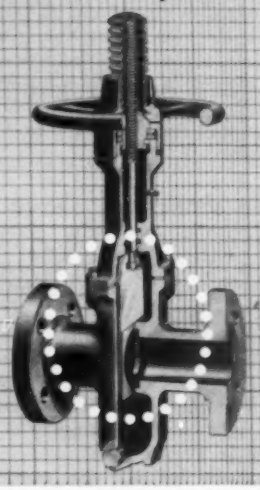

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Storage company wants to increase withdrawal

Natural Gas Storage Co. of Illinois wants to boost its peak day withdrawals of gas stored underground. If FPC approves, the storage company will increase maximum daily delivery rate on a peak load day to 650 MMcf, a 75 MMcf increase.

To do this, the company will expand use of the Galesville and Mount Simon geological formations near Herscher, Ill., and the Cooks Mill storage facility near Sullivan, Ill.

Another 75 MMcfd increase was allowed last year.

Peoples' affiliates plan expansion

Hearings are under way on Peoples Gulf Coast Natural Gas Pipeline Co.'s plan to increase its system capacity by 85 MMcfd (Dockets G-19086 et al).

Peoples will sell all of its gas to its affiliate, Natural Gas Pipeline Co. of America. In turn, NGPL will sell the gas to present and prospective customers of both systems, thus becoming the sole seller of gas on the combined system.

Covered in the $43.5 million plan is 371 miles of 30-in. line, 56 miles of supply lines and a new 6700-hp compressor station.

Sale stoppage okayed

A recent FPC ruling allows a group of independent producers to abandon gas sales to an interstate pipeline company.

The sales were discontinued in 1957 and the pipeline company, United Gas Pipeline Co., has made no demands for gas since that time. The gas is now being sold intrastate in Texas.

In its action, the commission reversed a decision filed last fall by Examiner Francis L. Hall. He denied the abandonment on the ground that it was not permitted by "the present and future public convenience and necessity."

Form new company

Brunner C. Barnes and Robert R. Click have formed Barnes & Click, an engineering firm specializing in consultation and design work. Offices are in the Rio Grande National Building in Dallas. The men will specialize in natural gas production and processing work.

So-Cal-SoCounties build line for new supply

Construction started last month on a new SoCal-SoCounties line. The 115-mile, 36-in. pipeline runs across the Mojave desert from Newberry, through the Cajon Pass to Placentia in Orange county, Calif.

Contractors are Young & Anderson Co. of Brea, Calif.; Hood Construction Co., Whittier, Calif.; J. P. Neill Inc., Dallas; and Morrison-Knudsen Co., Los Angeles.

Completion of the $19 million project to deliver 300 MMcfd into the Los Angeles basin is set for August. Transwestern Pipeline Co. will move the gas to the California-Arizona border, where it will be picked up by Pacific Lighting Gas Supply Co. PLGS also has underway a new 116-mile, 34-in. pipeline to move the gas to Newberry.

Transco 'willing and able' to meet Lynchburg needs

FPC has reopened proceedings giving Lynchburg (Va.) Gas Co. another chance to get a supply of gas from Transcontinental Gas Pipe Line Corp. (Docket G-18322).

Last October, an FPC examiner denied Lynchburg's request. He said the record failed to show that Transco had sufficient gas to render this service without impairing its deliveries to present customers.

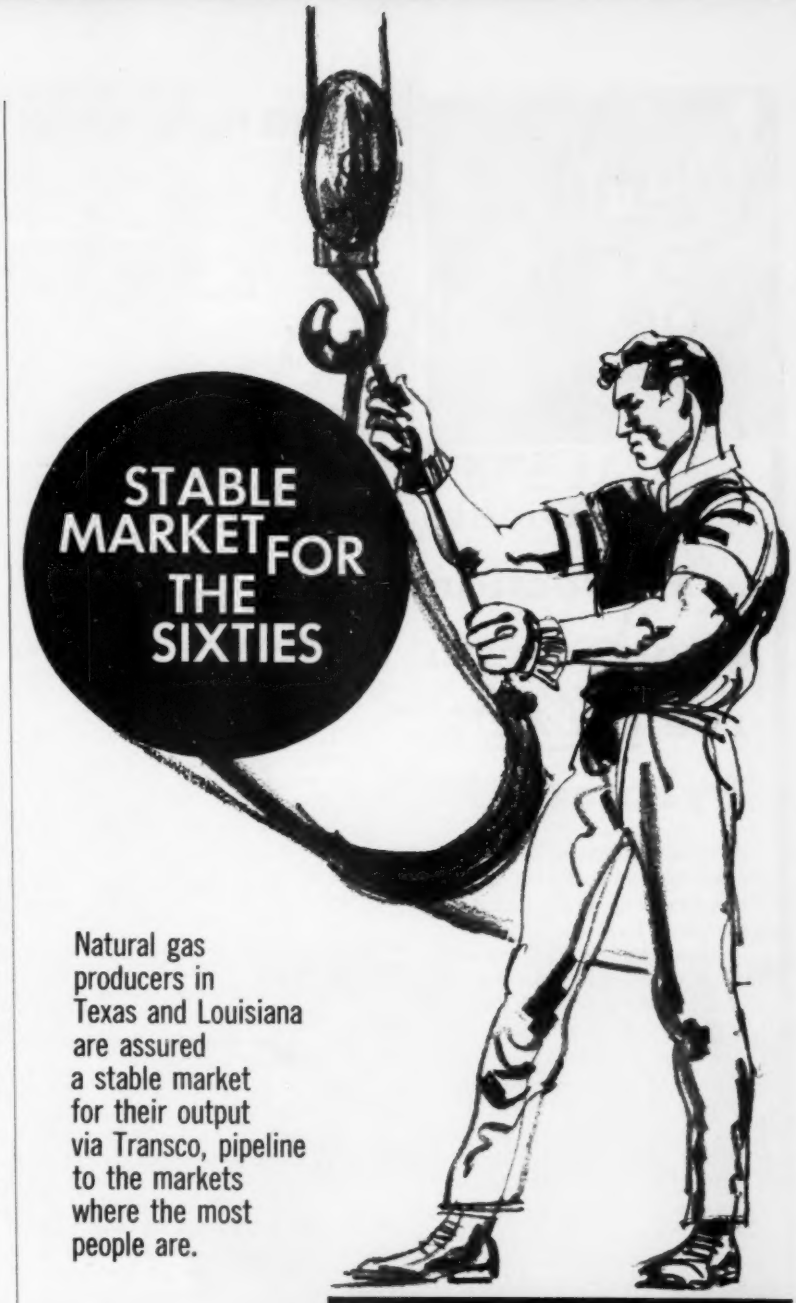
Transco said it would serve Lynchburg only if certain requested facilities were authorized. Now that those facilities have been approved, Transco said it is "willing and able" to supply Lynchburg's third-year requirements.

Pacific has new gas find

Pacific Petroleums Ltd. has confirmed a new Mississippi gas find in the Pocketknife area of northeastern British Columbia. The well flowed gas in three drill stem tests as follows: Test 1, 7.4 MMcfd; Test 2, 8.3 MMcfd; and Test 3, 3 MMcfd.

Storage project approved

Atlantic Seaboard Corp. has permission to activate and operate its Terra Alta storage project in the Portland and Union districts of Preston county, W. Va. Involved in Docket G-17774 are 43 miles of 20-in. line and a 5500-hp compressor station. The entire project is estimated to cost $25.2 million.



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Alnor INSTRUMENTS

GAS Pipeline People

JAMES J. MCMAHON has joined Northern Natural Gas Co. in Omaha as senior reserves engineer. McMahon was with Shell Oil Co. in Houston before joining Northern.

JACK D. SULLIVAN is manager of the income tax department of Texas Gas Transmission Corp., Owensboro, Ky. Sullivan has been a tax accountant with both Transcontinental Gas Pipe Line Corp. and Trunkline Gas Co.

STUART L. LAMKIN, ARTHUR C. MARTINSON, and LAWRENCE J. MUELLER, all assistant controllers of Transcontinental Gas Pipe Line Corp., Houston, have been elected to membership in the Controllers Institute of America.

L. L. WARRINER has been elected chairman of the board of the Cooper - Bessemer Corp., Mount Vernon, Ohio. At the same time, GRANT C. WOODARD, general sales manager, and HAROLD C. JOHNSON, manager of manufacturing, were elected vice president. Warriner succeeds L. F. WILLIAMS, who is stepping down from the chairmanship after more than 40 years' service with Cooper-Bessemer. He will continue as a director and as a member of the executive committee.

WILLIAM B. ADAIR has been named assistant vice president and division manager of Maloney-Crawford Tank & Manufacturing Co., Houston.

EDWARD L. FALLS JR. has been promoted to executive assistant to the general manager of Motorola's Communications Division, Chicago. Falls, as a vice president of Motorola Communications & Electronics Inc., has been managing sales and service of radio communications products in the southern states.

James McMahon
Northern

Jack Sullivan
Texas Gas

Replacing Falls in that post is ROBERT N. SWIFT, formerly vice president and manager of the Midwest sales area. Swift's new offices are in Dallas. ROBERT F. DAVIS succeeds Swift in the midwestern post. He headquarters in Chicago.

Several appointments have been made by Cooper-Bessemer Corp., Mount Vernon, Ohio. DAVID M. SALLS, manager of gas industry marketing, is now product sales manager for the new RT-248 gas turbine. FRANK L. FRIEDLI is manager and REED D. HAMILTON is assistant manager of the En-Tronic Controls Division. RICHARD H. VANBERGEN is a sales engineer in the New York branch office; R. M. BOONE transfers to the Odessa, Texas branch office; OWEN T. TOLSON is a sales engineer in Shreveport; DAVID K. GOFF is working as a sales engineer in the Houston branch; and WILLIAM R. BOHANNAN joins Cooper-Bessemer International in Caracas, Venezuela, as a sales engineer.

MARVIN GUNTER has been appointed district manager of microwave and industrial product sales for Motorola Communications & Electronics Inc. in the southern states. He will headquarter in Dallas.

K. C. SLOWMAN has transferred to Chicago as a sales engineer for the Buflovak Equipment Division of Blaw-Knox Co.

L. L. Warriner
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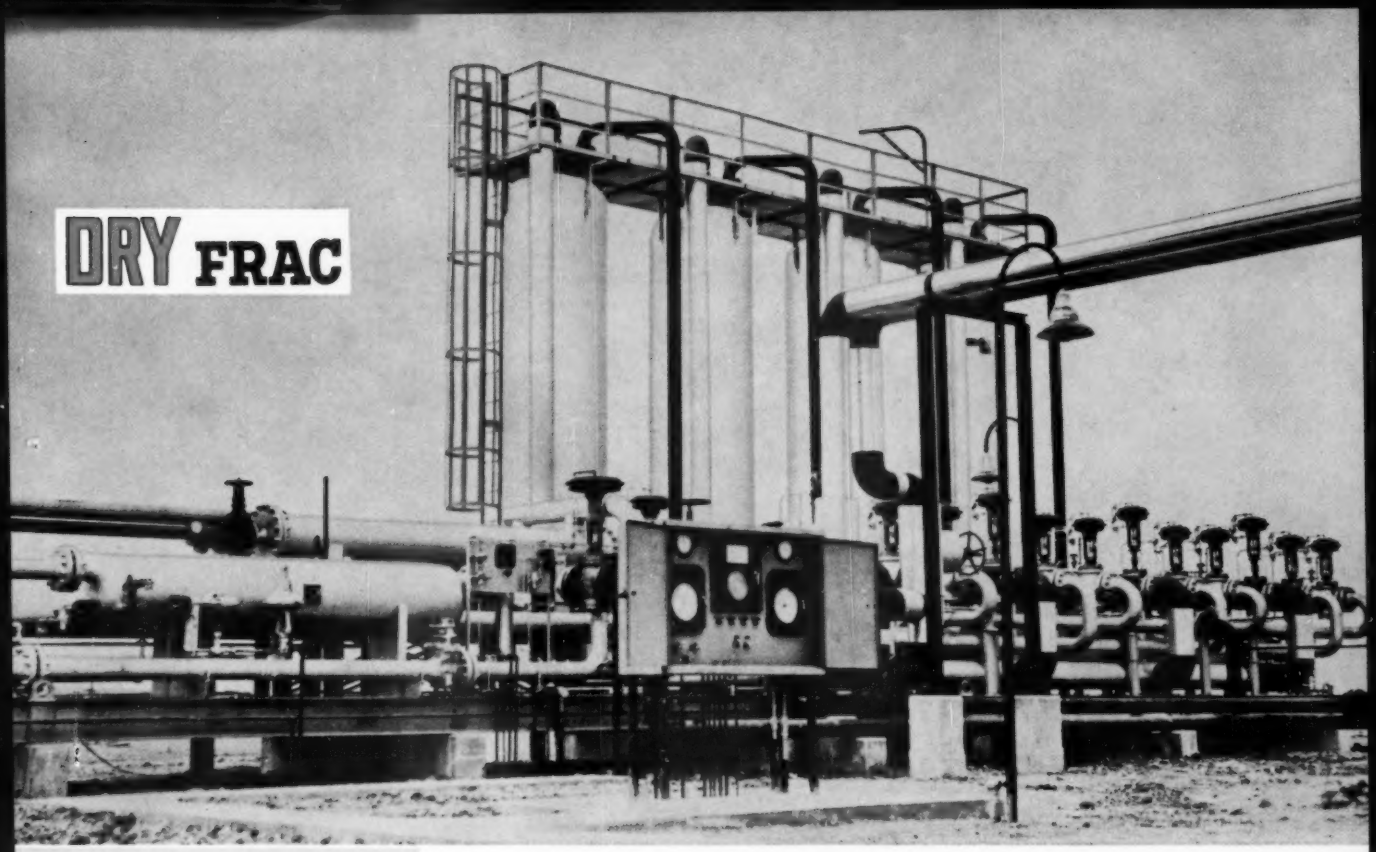

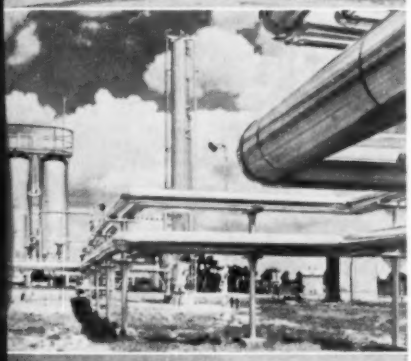

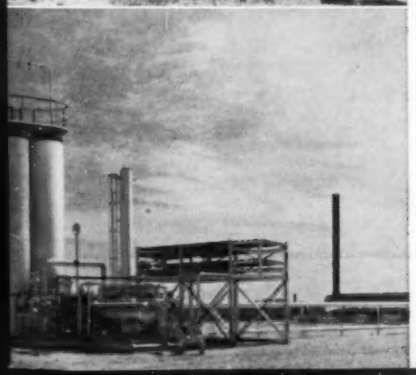

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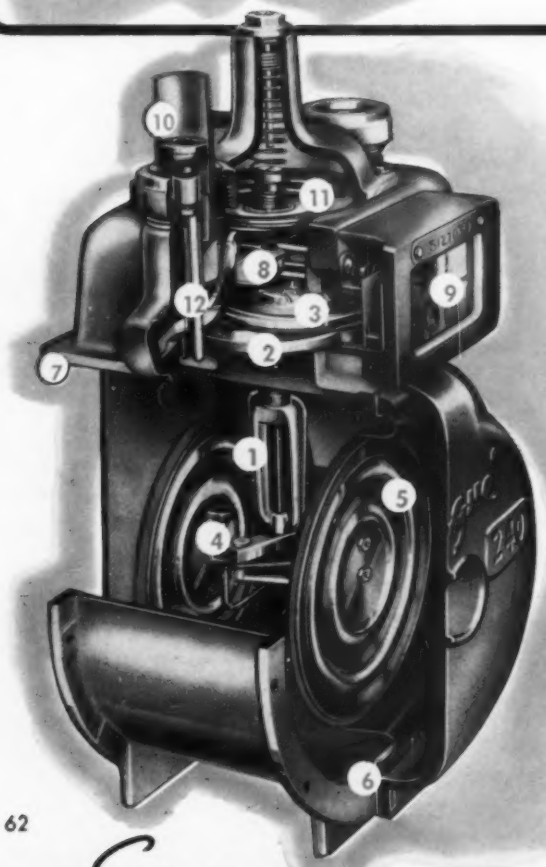

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